Open versus Closed Platforms: a Business Model perspective on Product-Service Systems at Philips

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In partial fulfilment of the requirements for the degree of

Master of Science
in Innovation Management

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Management Summary

Product-centric companies are looking for new ways to do business since the increased competition on pure product value propositions (Tischner, Verkuijl & Tukker, 2002). In this context, a product-service system (PSS) concept is a growing trend for companies that want to innovate on services in addition to product innovation (Mont, 2002). A product-service system is defined as a set of products and services that are capable of jointly fulfilling customer needs in an economical manner (Goedkoop et al., 1999; Tukker, 2004). Insights into the business model development and implementation of PSS are still very limited (Baines et al., 2007). In addition, especially product-centric firms frequently struggle with PSS innovation from a business model perspective. A majority of the product-centric firms have insufficient resources and capabilities to enable service, or product-service innovations (Ulaga & reinartz, 2011). Therefore, firms must develop service-related resources and capabilities (den Hartog et al., 2010), or agree on strategic partnerships with a party who has the required resources and capabilities. Such a long-term collaborative relationship can result in fast project development times, lower development and productions costs and a better product quality. Going one step further, this study especially addresses a more platform-type business model view on PSS. Evens et al., (2006) argued that platform strategies can also be a significant enabler to multi-actor PSS. Since a PSS consists of multiple components requiring different resources and capabilities, a viewpoint with different actors integrated through a platform architecture becomes relevant. However, the combination of a PSS with such a platform-oriented business model lacks depth in the academic literature. Therefore, this study provides an in-depth multiple case-study research on platform business models for product-service systems.

Research purpose

The research purpose is to generate insights into the patterns and challenges of open versus closed platform ecosystems and business model innovation of product-service systems within a product-centric firm. Insights from both practitioners and academics will be used in this research. The main research question is as follows:

Main Research question: What are the key learnings and patterns of open versus closed platform business models for product-service systems at Philips?

Scientific Background highlights

The general role of a business model is to provide a set of generic level descriptors of how a firm organizes itself to create and distribute value in a profitable manner (Baden-Fuller & Morgan, 2010). In addition, Dorf & Byers (2005) define a business model as a set of assumptions about how a firm creates and captures appropriate value for all its stakeholders by connecting technology to economic profits. A common method of visualizing a business model is as a configuration of multiple components (Baden-Fuller & Mangematin, 2013; Morris, Schindehutte & Allen, 2005). In addition, the concept goes further into a more network based view with transactions between different actors in an ecosystem (Sabatier, Mangematin & Rouselle, 2010; Chesbrough & Rosenblom, 2002; Schafer, Smith, & Linder, 2005). Therefore, a component-based view and a transaction-based view of business models can be distinguished.

The idea of platforms is extended to a more network based view by Iansiti and Levien (2004). The reason to link platforms to a ‘broader’ ecosystem perspective, is that stand-alone strategies do not work if success depends on multiple firms that influence the creation and delivery of a product (Smedlund, 2012). Building on these platforms in ecosystems, such platforms are often associated with “network effects”: that means, the more users who adopt the platform, the more valuable the
platform will become for the platform owner, and the more attractive the platform will be for complementary innovations (Cusumano & Gaver, 2002; Gaver & Cusumano, 2014). Opening a platform for third-party developers can largely increase adoption by harnessing network effects, and stimulate complementary innovation (Eisermann, Parker & Alstyne, 2008). The strategic choice to open the platform to third parties or not, divides the platform business models into open and closed (Smedlund, 2015). A closed platform thus does not require continuous integration of new third parties. The collaboration is limited to a selected number of firms (Smedlund, 2015). However, the trade-offs between “open” and “closed” platforms are very complex and not generally agreed in literature (Eisermann, Parker & Alstyne, 2008; Gaver & Cusumano, 2008). Selecting the optimal levels of openness is crucial in order to increase the value of the platform, and maintain the control over the platform (Gaver & Cusumano, 2002; West, 2003).

Research Methodology

In order to answer the exploratory oriented research questions, a multiple case-study research approach is used (Eisenhardt, 1989). In order to avoid premature closure, an open research attitude is used. To find emerging patterns, identify key learnings of the choices made in the business models and business ecosystems, a process research approach is adopted in this research (Langley, 1999). Cases were selected with a high dependence between the product component and service component of the product-service system. This means that the PSS components create no value with single use (Nishino et al. 2013). Eventually four case-studies were selected. Namely, Hue, CityTouch, Medido and DirectLife.

In total 19 interviews were carried out in order to get a complete view of the business model related changes including the platform development (open versus closed). All the interviews were recorded and transcribed verbatim. The first step of the analysis contains within-case analysis to describe the business model and business ecosystem including the most important changes for each case separately (Eisenhardt, 1989). As the second step in the within-case analysis, unique patterns were identified in the business model. Furthermore, cross-case analysis is carried out to find unique cross-case patterns (Eisenhardt, 1989).

Results cross-case analysis and practical implications

The business model patterns, digitization, leverage customer data, mass customization, revenue sharing and customer loyalty appeared in all the cases and are interesting business model similarities. However, major differences appeared on the platform architecture of the different cases.

The cases analyzed in this report show a large variation in PSS platform design and associated strategies. At the beginning of PSS business model development, a decision has to be made about opening the business or not. Here openness refers to the inclusion of outside partners into normally closed value creation processes. This choice is very important because setting a certain platform architecture will have consequences for the other choices. Important elements here are the resources and capabilities of the platform leader. For a product-centric company, it could be more efficient to agree on partnerships for the service component since the development of products and services is a completely different process. However, creating a PSS in such an open business model has major consequences for revenue sharing i.e. value capturing and risks. On the one hand, the risks are bigger because in an open business model, the platform leader depends on other actors. But on the other hand, since the risks can be shared among the different partners in the ecosystem. In most cases, creating value with different partners in an ecosystem will be the most effective choice. Here, the investments in product/and service components are lower, the risks can be shared and such an open business model architecture can be designed in many ways in order to get competitive advantage. The
conclusions and key learnings of the cases DirectLife and Medido can be compared in order to make a decision.

When the choice is made to create an open business, the choice has to be made to open the PSS platform (and allow continuous integration of partners to create value) or not. When the product-service system allows integration of other complementary products and/or services, opening the PSS platform is an effective way to increase the value on the platform. If the product-service system is placed in a more niche market, it could be more effective to have a closed PSS platform design and build the PSS with a few fixed partners. In such a closed PSS platform design with fixed partners, risks and investments can be shared and clear agreements can be made in order to keep control of the platform.

Opening the PSS platform for continuous integration of new partners provides large challenges in keeping control of the quality and value capturing of the platform. However, a product-service system provides practical implications that can reduce the loose of control and can solve value capturing issues. Opening only one component (the service component of the product component) of the PSS platform implies control and value capturing on the closed PSS component. Here the closed PSS component serves as the platform control point. When the PSS is delivered directly to consumers, opening the service component of the PSS will be more efficient in case of a product-centric company as platform leader (see the Hue-case conclusions and key learnings for more arguments). On the other hand, in case of delivering the PSS to organizations, opening the product component could be a better solution. This is mainly because organizations are more likely willing to pay for digital service value, and because organizations normally have more problems with depending on a single hardware provider (See the CityTouch-case conclusions and key learnings for more arguments).

However, an open PSS platform requires significantly more investments compared to a closed PSS platform. This is mainly because of the costly open platform architecture, and the value the platform owner has to leave to complementary product providers in order to make the platform more attractive. This is especially the case in the beginning when the installed base is relatively small. However, in order to keep control of this investments, ‘lock-in’ and ‘add-on’ are important business model design patterns. When there is a very low lock-in, or there is no lock-in possible, than a platform owner should doubt if the return on investment risks are not too high. Therefore, lock-in is an important business model design element to build in the business model. In addition, the add-on business model design element is very effective to gradually increase the switching costs and therefore the lock-in effect.

**Conclusion**

This study especially addresses a platform-type business model view on product-service systems. It argues that platform-type business models are very relevant for product-service systems, and therefore deserve more attention in academic literature. This study provided four designs of PSS platform architectures. In addition, Pros and cons are given of open versus closed PSS platform business models.
Preface

Na ruim zeven maanden werk is de tijd gekomen waarin ik de laatste zinnen van mijn Master Thesis op papier mag schrijven. Met dit werk sluit ik mijn zes jaar durende studie carrière af aan de Technische Universiteit Eindhoven, en voel ik me klaar voor een nieuwe uitdaging. Het een grote uitdaging geweest voor mij om deze opdracht tot een goed einde te brengen. Woorden schieten te kort om te beschrijven hoeveel ik van dit werk heb geleerd. Aan de ene kant heb ik bijzonder veel theoretische kennis op mogen doen, en mijn academische vaardigheden kunnen verbeteren. Aan de andere kant heb ik bijzonder veel over mezelf geleerd tijdens dit project. Waar ik tijdens groepsprojecten altijd alles met andere samen kon beslissen, moest ik hier vaak zelf knopen doorhakken wat niet altijd even makkelijk was. Hoe dan ook, dit werk was nooit tot stand gekomen zonder de hulp en inbreng van verschillende mensen die ik hier graag voor wil bedanken.


Uiteindelijk is het me allemaal meer dan waard geweest en kijk ik vol vertrouwen uit naar de toekomst!

Koen Crooymans

Eindhoven, september 2015
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1. Introduction

“People don’t want a quarter inch drill, they want a quarter inch hole!” (Ted Levitt)

“What the customer buys and considers value is never a product. It is always a utility – that is, what a product does for him” (Peter Drunker)

Product-centric companies are looking for new ways to do business since the increased competition on pure product value propositions (Tischner, Verkuijl & Tukker, 2002). In this context, a product-service system (PSS) concept is a growing trend for companies that want to innovate on services in addition to product innovation (Mont, 2002). Such a product-service system allows selling not only products but also additional services that supplement customer needs (Tukker, 2004). The development of information communication technology, which enables the construction of service platforms through digitization and networks, is related to this trend. Furthermore, integrated product and service combinations can lead to positive economic and environmental effects for industry and society through its improving efficiency potential (Mont et al., 2006). In addition, such product and service solutions create incentives for optimizing energy and consumables, as well as prolonging a product’s life (Tukker, 2004).

A product-service system is defined as a set of products and services that are capable of jointly fulfilling customer needs in an economical manner (Goedkoop et al., 1999; Tukker, 2004). Since 2004, product-service systems is an emerging topic and most of the research has focused on the design of a PSS value proposition (Baines et al., 2007). However, insights into the business model development and implementation of a PSS are still very limited (Baines et al., 2007; Gaiardelli et al., 2014). Therefore, more knowledge about business models for PSS is needed in order to increase the number of economically successful PSS implementations. A lot of different business models are possible for value propositions with a service component. So, in terms of competitiveness, the business model is a key factor where a company can differentiate itself from its competitors (Schafer & Milne, 2010). In addition, especially product-centric firms frequently struggle with service innovation (Chirumalla, 2013; Gebauer et al., 2005). Research by Ostrom et al. (2010) concluded that the reason for this is the stubborn embrace of product-centric firms of the “invention model”, which is centered on structured, bricks-and-mortar product development processes. This product-centric culture and logic of doing business raises extra challenges regarding business model development of PSS propositions.

In addition, a majority of the product-centric firms have insufficient resources and capabilities to enable service, or product-service innovations (Ulaga & Reinartz, 2011). Therefore, firms must develop service-related resources and capabilities (den Hertog et al., 2010), or agree on a strategic partnership with a party who has the required resources and capabilities. Such long-term collaborative relationships can result in faster project development times, lower development and production costs and a better product quality. At the same time, it challenges the transactional-based view of the business model. In this view, the actors, including the value flows between them, are positioned in a network. Such a network is often called a value network or a business ecosystem (Johnson et al., 2008). Even the consideration of PSS development in such a collaborative environment as a business ecosystem has not received much attention in academic literature (Morelli, 2006).

Going one step further, this study especially addresses a more platform-type business model view on PSS. Platform-type business architectures emerged recently in several business scenes. For example, the smart phone industry adopted its service proposition with a platform. Apple, for instance created a platform where app creators and complementary product developers can add value on. Through this way, a lot of content and different possibilities are available for Apple smartphone users.
This ‘platform’ viewpoint is also an emerging topic in the academic literature. For example, Gawer & Cusumano (2007; 2009; 2014) wrote many articles about platform leadership and the economic power of an established platform. A major point of discussion in the platform business model literature is to open the platform for continuous integration of new parties or not; i.e. open versus closed platforms. However, such a platform viewpoint is primarily associated with software and digital value (Gawer & Cusumano, 2014). Therefore, product components are overlooked in the platform literature. Evens et al., (2006) argued that platform strategies can also be a significant enabler to multi-actor PSS. Since a PSS consists of multiple components requiring different resources and capabilities, a viewpoint with different actors integrated through a platform architecture becomes relevant. However, the combination of a PSS with such a platform-oriented business model lacks depth in the academic literature. Therefore, this study provides an in-depth multiple case-study research on platform business models for product-service systems. Especially the emerging patterns of the PSS business models and the platform strategies will receive major attention. The collected case data cover the most important business model related decisions since the start of the business.

1.1. Practical Background
This study includes analyses of several case-studies that are developed in different departments of the multinational Royal Philips N.V., which originally can be classified as a product-centric firm. A product-centric firm, regardless of its share of services, primarily perceives itself as an entity that develops and sells physical goods (Kindstrom & Kowalkowski, 2014).

In 2013, Royal Philips N.V. CEO Frans van Houten indicated in an interview that Philips should focus more on selling solutions instead of selling products (Kosters, 2013). Since roughly eight out of ten Philips employees are still hardware oriented, Philips does not have the required resources and capabilities to provide pure service propositions. However, a product-service system combines hardware and services and therefore could be a successful and profitable alternative to stay competitive.

Since approximately 2008, the first product-service system propositions developed at Philips entered the market. The vision behind that choice was that customers are increasingly expecting that their products are network connected, and thereby offering extra functionality. Since that moment, Philips started to invest in this topic with the purpose that Philips is able to participate more effectively in this rapidly-changing business landscape. “More and more products have network connection and are becoming part of larger ecosystems (Platforms) of content, social media, products and services”. This means that businesses are increasingly expected to deliver more than a product alone by providing solutions that enhance the customer complete experiences.

A major challenge is the business (model) development process of product-service systems at Philips. The product-centric company Philips operates with very traditional business models that function as a pipeline. In such a pipeline, after the product is created, they are distributed to retailers and sold to a customer, or sold directly to a customer. In that case, there is a linear flow. On the other hand, a PSS platform can create a network where users, in addition to consuming, can also add value to the platform. Therefore, direct and indirect network effects become interesting topics. However, such business models require a complete different thinking and resources and capabilities compared to the traditional pipeline business models. For example, customer-centricity and monetization on a platform differs radically compared to traditional business models. Philips therefore faces major challenges in creating such platform oriented business models for PSS.
This research is carried out for Philips Industry Consulting, which is part of Philips Innovation Services (PInS). Philips Industry consulting consists of an innovation management and an operations management team that support internal and external projects. In order to support internal and external projects concerning business modelling for product-service systems, Industry Consulting benefits from in-depth knowledge of PSS case-studies from a business model perspective.

1.2. Research Purpose and questions

This project investigates four PSS case-studies from a business model perspective developed in different departments of Philips. Different platform strategies are compared in order to evaluate the pros and cons for open versus closed platform business models. The research purpose is to generate insights into the patterns and challenges of open versus closed platform ecosystems and business model innovation of product-service systems within a product-centric firm. Insights from both practitioners and academics will be used in this research. The main research question is as follows:

Main Research question: What are the key learnings and patterns of open versus closed platform business models for product-service systems at Philips?

In order to answer this main research question, a multiple case-study research consisting of four PSS case-studies is conducted. The analysis part of the research consists of a within-case analysis and a cross-case analysis following the case-study research method of Eisenhardt (1989). The methodology section will elaborate on this in chapter three.

In order to answer the main research questions, sub-questions are defined for the within-case analysis as well as for the cross-case analysis part.

Sub-questions concerning the within-case analysis part:

The following questions are answered for each case separately.

- What does the business model look like, and what are the most important business model related changes since the start of the product-service system?
- Which business model patterns can be identified in the business model?
- What actors are involved in the business ecosystem from the perspective of the focal firm?
- What are the key learnings and conclusions from this case?

The combined answers of these research questions per case are the input for the cross-case analysis.

Sub-questions concerning the cross-case analysis part:

- What are the similarities and differences in business model patterns of the different cases?
- What different types of PSS platforms can be identified in the different cases?
- What are the components and characteristics of an open PSS platform?
- What are the components and characteristics of a closed PSS platform?
- What are the pros and cons of open versus closed PSS platforms?

Eventually the combination of the answers have led to an answer to the main research question.
2. Scientific Background

The main concepts that are relevant for this research are business models, business ecosystems, product-service systems and platforms. All these concepts are emerging topics in the literature. However, articles that combine these emerging topics are rare in the academic literature. The term ‘business models’ occurs in combination with (business) ecosystems, and also in combination with product-service system. However, a combination of (external) platforms with product-service systems is not yet explored in the literature and therefore a main focus of this report. In this section, the topics including the interrelationships will be discussed using academic literature.

2.1. Business Models

In order to acquire significant success and profit for an innovative product or service, a proper business model is needed (Chesbrough, 2007; Magretta, 2002). Although, no generally accepted definition of the term “business model” has emerged (George & Bock, 2011; Morris, Schindehutte, & Allen, 2005). Diversity in the available definitions leads to confusing in terminology, since business model, strategy, business concept, revenue model and economic model are often used interchangeably (Morris, Schindehutte, & Allen, 2005). The general role of a business model is to provide a set of generic level descriptors of how a firm organizes itself to create and distribute value in a profitable manner (Baden-Fuller & Morgan, 2010). In addition, Dorf & Byers (2005) define a business model as a set of assumptions about how a firm creates and captures (appropriate value) for all its stakeholders by connecting technology to economic profits. From an economic perspective, a business model focuses on profit generation, how to make money and how to sustain this profit over time by delivering to customers (Demil & Lecocq, 2010; Morris, Schindehutte & Allen, 2005).

In addition to the definition of Dorf and Byers (2005), the difference between value creation and value capturing is a point of discussion in the academic literature. The value proposition however, should be the source of value creation for the users by the offering based on technology (Chesbrough & Rosenbloom, 2002). After creating value, the firm must address how it will capture some portion of that value for itself (Teece, 1986). In many businesses, creating and capturing value involves third parties within a business ecosystem (Christensen and Rosenbloom, 1995; Chesbrough & Rosenbloom, 2002). The business model ‘settings’ is of great importance in order to capture value from technology. Positive alignment with the value network can leverage the value of technology. Reagens and Zuckerman (2008) elaborated on the ecosystem perspective on value creation and capturing of chesbrough and Rosenblom (2002). They mention that collaborating with heterogeneous partners will result in a higher value creating, but in a lower value capturing. And, on the other hand, partnering with similar firms will decrease the value creation potential but will allow the focal firm to use its bargaining power in order to capture more value.

In their research, Baden-Fuller and Morgan (2010) provided an overview of some important business model definitions used in the literature (See appendix I). Zott, Amit and Massa (2011) proposed an article about the recent developments and future research about business models. They concluded that the challenge of defining business models lies in the consideration of the content and the process of ‘doing business’ which should operationalize the construct.

A common method of visualizing a business model is as a configuration of multiple components (Baden-Fuller & Mangematin, 2013; Morris, Schindehutte & Allen, 2005). In addition, the concept goes further into a more network based view with transactions between different actors in an ecosystem (Sabatier, Mangematin & Rouselle, 2010; Chesbrough & Rosenblom, 2002; Schafer, Smith, & Linder, 2005). Therefore, a component-based view and a transaction-based view of business models can be distinguished.
**2.1.1. Component-based view**

The current literature lacks consensus of the key components of the business model (Morris, Schindehutte & Allen, 2005). The number of components mentioned varies from four to eight. In total, 24 different components were identified by Morris, et al., (2005). The most common components were; economic model, customer interface/relationship, partner network, internal infrastructure/connected activities and target markets. The framework developed by Osterwalder and Pigneur (2010) is a widely used framework with a relatively high level of detail. See table 1 for the components of the business model canvas by Osterwalder and Pigneur (2010) including short descriptions.

<table>
<thead>
<tr>
<th>Building Block of Business Model</th>
<th>Description</th>
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<tr>
<td>Customer Segments</td>
<td>The Customer Segments Building Block defines the different groups of people or organizations an enterprise aims to reach and serve.</td>
</tr>
<tr>
<td>Value Proposition</td>
<td>The Value Proposition Building Block describes the bundle of products and services that create value for a specific Customer Segment.</td>
</tr>
<tr>
<td>Channels</td>
<td>The Channels Building Block describes how a company communicates with and reaches its Customer Segments to deliver a Value Proposition.</td>
</tr>
<tr>
<td>Customer Relationships</td>
<td>The Customer Relationships Building Block describes the types of relationships a company establishes with specific Customer Segments.</td>
</tr>
<tr>
<td>Revenue Streams</td>
<td>The Revenue Streams Building Block represents the cash a company generates from each Customer Segment (Costs must be subtracted from revenues to create earning).</td>
</tr>
<tr>
<td>Key Resources</td>
<td>The Key Resources Building Block describes the most important assets required to make a business model work.</td>
</tr>
<tr>
<td>Key Activities</td>
<td>The Key Activities Building Block describes the most important things a company must do to make its business model work.</td>
</tr>
<tr>
<td>Key Partnerships</td>
<td>The Key Partnerships Building Block describes the network of suppliers and partners that make the business model work.</td>
</tr>
<tr>
<td>Cost Structure</td>
<td>The Cost Structure describes all costs incurred to operate a business model.</td>
</tr>
</tbody>
</table>

*Table 1: Business Model Canvas (Osterwalder et al., 2010)*

This framework by Osterwalder and Pigneur (2010) is used in many other academic studies (Cortimiglia et al., 2015; Ghezzi, 2013). In addition, the components have great similarities in comparison with the other business model frameworks summarized by Morris et al. (2005). The interactions of the components are a major point of analysis in order to judge the effectiveness of a set of business model components. Mismatches can occur between the components of a business model with major consequences for the total combination of components (Lehoux, Daudelin & Williams-Jones, 2014).

The components of existing business models do also have impact for established firms that pursue a new business model alongside an existing one. For example, when the old and the new business models share some components then there could be a fit between the business model components (Kim & Min, 2015). A major problem in practice is that managers focus on information that is consistent with their dominant business model and therefore fail to see information that differs from that (Chesbrough, 2010).

**2.1.2. Transaction-based view**

Such a component based framework as the in 2.1.1. described Business Model Canvas is adequate to describe the business model of a single organization (Johnson, Christensen & Kagermann, 2008). In addition, such a component based framework is less adequate in analyzing the interdependent nature of the growth and success of companies that are evolving in the same network of actors, a ‘business ecosystem’. A business ecosystem refers to the network comprising a focal firm, including its suppliers,
complementors and customers (Adner & Kapoor, 2010). The key feature of a business ecosystem is the interconnectedness of companies including the processes of competition and cooperation (Lansiti & Levien, 2004). Such an ecosystem ensures that the business can deliver value and scale up (Chesbrough & Rosenbloom, 2002).

The process of delivering value through a business ecosystem is in line with the ‘partner network’ which is a common component in many component-based business model frameworks (Morris et al., 2005). The role that an organization has in an ecosystem is of high importance for a successful business model (Zott & Amitt, 2008). In addition, Zott and Amitt (2008) emphasize that a business model demonstrates how an organization creates value for all the exchange partners. Tapscott et al., (2000) for example suggest a value model to visualize how a web of business actors operates. The value map depicts all key classes of participants (partners, customers, suppliers) and value exchanges between them (tangible and intangible benefits and knowledge).

In contrast to the number of component-based frameworks for business models, a few tools exist for the analysis of a firm position in a business ecosystem. Elke den Ouden (2012) developed a tool to visualize and understand the relationships and interdependencies between firms in an ecosystem. This tool illustrates the interdependencies that are not represented in Osterwalder’s framework elements (channels with suppliers, partners and customers). The tool consists of several actors: customer, provider of systems, provider of goods, provider of services, provider of content, marketing & communication, supplier, enabler, financier, Godfather, Government, Competitor and Society. Especially the last five components are useful when visualizing a complete value network including the value for the society as a whole. To visualize a business ecosystem around the focal company it is sufficient to use the first eight components (Den Ouden, 2012). In addition, four transactions are available to connect the actors, namely, Goods & Services, Money & Credits, Information and Intangible Value.

Without a well worked-out business model, companies are less likely to succeed to capture and deliver value from their innovations (Teece, 2010). Taking into account all the theoretical implications mentioned above, the component-based view in combination with the transaction-based view will provide a complete view of the business model.

2.2. Platform Business Models

A product is a platform when ‘it is one component or subsystem of an evolving technological system, when it is strongly functionally interdependent with most of the other components of this system, and when end-user demand is for the overall system, so that there are no demand for components where they are isolated from the overall system’ (Gawer & Henderson, 2007: P.46). This idea of platforms is extended to business ecosystems by Lansiti and Levien (2004). The reason to link platforms to a ‘broader’ ecosystem perspective, is that stand-alone strategies do not work if success depends on multiple firms that influence the creation and delivery of a product (Smedlund, 2012). Argued from the other side; a business ecosystem can be defined as a network of interconnected organizations, organized around a focal firm or a platform, which incorporates both production and use side participants, and focuses on the co-creation of new value through innovation (Thomas, 2013). However, so far in the academic literature, this combination of platforms and ecosystems is considered as a combination that is mainly related to product-based businesses. But according to Chesbrough (2011), a service business could also be a proper starting point for a platform. Therefore, a combination of a product and a service (a product-service system) can be built as a platform either. Building on these platforms in ecosystems, such platforms are often associated with “network effects”: that means, the more users who adopt the platform, the more valuable the platform will become for the platform owner, and the more attractive the platform will be for complementary innovations.
Another advantage of the network effect is, as the platforms grow in adoption, they become harder to dislodge by rivals or new entrants (Gawer & Cusumano, 2014). This is due to the switching costs for late entrants when gaining market share in a market where a platform already has a high installed base (Greenstein, 1997). According to Gawer and Cusumano (2008), platform leaders should focus on a core function to encourage other companies to develop complementary applications that grow the complete ecosystem (coring). In addition, they should shape market dynamics by gaining control of the installed base to outcompete the competitors (tipping).

2.2.1. Installed base
As introduced in the previous section, the installed base is a major point of focus for platform leaders (Greenstein, 1997). Users anticipate that platforms with a larger installed base will also offer a wider number and variety of complementary products and services (Evans, 2003; Rochet & Tirole, 2003). In other literature, this is similar to the so-called indirect network effects. The direct link between customers (peer to peer) is named direct network effects. Due to this network effects, most of the platform literature predicts a ‘winner-take-all’ (WTA) outcome, where the platform with the largest installed base will win (Besen & Farell, 1994; Caillaud & Jullien, 2003).

Assuming this WTA outcome will be the case, the platform actors should embrace aggressive strategies to expand both their installed base of users and their stable of application providers (Cennamo & Santalo, 2013). Such a strategy is named a ‘get-big-fast’ strategy in most of the platform literature (Eocman, Jeho & Jangseok, 2006). This strategy roughly consists of two major components namely, to let the installed base grow as fast as possible, and to lock-in the users of the current installed base. On a more tactical level, such strategies can have distinct implications. For instance, platforms could set low prices to penetrate the market and let the installed base of users grow. In addition, when the installed base is big enough, the platform leaders can leverage on that by making money on the other side of the market. This can be done for example by charging developers of applications that access the platform to reach these potential customers (Clements & Ohashi, 2005; Eisenmann, 2006).

Another tactic is that they can use licensing strategies like for example ‘sweetheart deals’ to attract a lot of application developers or by exclusive contracting to secure content exclusivity and thereby enhancing the competitiveness of the platform (Armstrong & Wright, 2007; Hagiu, 2009; Lee, 2007).

However, several authors doubt these ‘winner-take-all’ logic and showed that multiple platforms may coexist because of asymmetrical or local network effects (Eocman et al., 2006; Shankar & Bayus, 2003). Other reasons can be the low costs of adopting multiple platforms (Eisenmann, 2007), or differentiated customer preferences (Armstrong & Wright, 2007). Such a ‘get big fast’ strategy is in some articles described as a ‘myopic’ or ‘dangerous’ strategy (Cennamo & Santolo, 2013; Eocman et al., 2006). Instead of purely focusing on a rapid growth of the installed base of users, platform leaders should control the trajectory of the platform evolution thoroughly.

Furthermore, the installed base of users is still an important performance measure of the platform. For instance, Schilling (2002) found a positive relationship between the size of the installed base and the likelihood to attract more developers for complementary applications, which in turn, will increase the installed base. In addition, Shankar and Bayus (2003) concluded that the network of customers is an important strategic asset of the platform. Furthermore, Wade (1995) showed in his research that also supporting products of the platform will be more likely to enlarge the installed base of the platform. Taking together the conclusions of Schilling (2002) and Wade (1995), a product-service system can attract (complementary) developers on both the service and the service component of the system.
Since feedback between customers and complementary goods is mutually reinforcing, strategies to manage complementary products and services are maybe even, or more important than those designed to increase the installed base (Gawer, 2010). Moreover, because users and complementary products and services are interdependent, making sure that a platform has a larger variety of them than the competitors will increase the installed base (Clements & Ohashi, 2005; Schilling, 2002).

When looking from the side of complementary products and services producers, they would prefer less competition for their own products (Boudreau, 2012). However, the benefits of selling products and services on a popular platform can outweigh the above described negative effects of competition (Evans, 2003).

Summarizing all above, Platforms should have a more holistic approach to build and position their ecosystems in the market (Boudreau & Hagiu, 2010). A clear vision and business model that account also for the level of competitiveness and distinctiveness of a platform system relative to its rivals is needed (Cennamo & Santalo, 2013). The platform competition contains much more than building the largest installed base of users.

### 2.2.2. Open versus closed platform business models

Opening a platform for third-party developers can largely increase adoption by harnessing network effects, and stimulate complementary innovation (Eisermann, Parker & Alstyne, 2008). The strategic choice to open the platform to third parties or not, divides the platform business models into open and closed (Smedlund, 2015). A closed platform thus does not require continuous integration of new third parties. The collaboration is limited to a selected number of firms (Smedlund, 2015). However, the trade-offs between “open” and “closed” platforms are very complex and not generally agreed in literature (Eisermann, Parker & Alstyne, 2008; Gawer & Cusumano, 2008). Selecting the optimal levels of openness is crucial in order to increase the value of the platform, and maintain the control over the platform (Gawer & Cusumano, 2002; West, 2003).

Opening the platform can have positive impacts on the creation of extensions, mostly called add-ons in the business model literature, and overall quality of the platform; for example the elimination of bugs and errors (Boudreau, 2010). In addition, opening the platform can reduce the customers fear about being locked-in to a single vendor (Farrell & Gallini, 1988). However, no lock-in effect, and thus very low switching costs can lead to a problem for the platform owner to keep control of the installed base (Economides & Katsamakas, 2006). Therefore, a balance in the power of the lock-in effect and thus the height of the switching costs should be found (Boudreau, 2010). The openness of a platform also invites other parties to add new value to the platform, which is an argument for opening innovation (Chesbrough, 2003).

Next to the positive relation with network effects of opening the platform, it leaves the creator with little control over the platform (Katz and Shapiro, 1986; Kende, 1998). It can reduce the platform owners share of profits by lowering entry barriers and introducing intersystem competition (Boudreau, 2010). And in case of simultaneous innovation by different partners, coherence may be lost across the system (Almirall & Casadesus-Masanell, 2010).

However, to not lose all the control over the platform, the platform could also be ‘partly’ opened (Boudreau et al., 2010). In his research, West (2003) concluded that most of the platforms called ‘open’ or ‘closed’ in the literature are not completely open or closed. Partly opening the platform can be done by using ‘rule-setting instruments’ to judge the access of third party developers (Boudreau et al., 2010). Especially in platforms with multiple components, such as product-service systems, a large diversity is possible about which sides of the platform to open, and which sides to keep closed.
2.3. Business Models for Product-Service Systems

A product-service system (PSS) consists of a tangible product component and an intangible service component together in one value proposition in order to fulfill specific customer needs (e.g., Tukker, 2004). The PSS definition by Goedkoop et al., (1990) is the mostly cited definition in the literature and is assessed as the most complete one. Therefore that definition will be used central in this report.

“A product-service system is a system of products, services, networks of players and supporting infrastructure that continuously strives to be competitive, satisfy customer needs and have lower environmental impact than traditional business models” (Goedkoop et al., 1990. P. 17)

The three general PSS business model areas defined by Tukker (2004) are central in the PSS business model literature, and therefore also in this research.

![Diagram of PSS business model categories](image)

Figure 1: The PSS business model categories (Tukker, 2004)

After pure product selling, the first main category of a PSS business model is product-oriented (PO) PSS. Here the company is still selling the product to the customer/business, but in addition to that, the selling company provides some additional services to increase the value and quality of the product.

In the use-oriented (UO) category of a PSS business model, the business model is less focused and dependent on selling the product compared to the PO business model. This is mainly because the ownership of the product is not transferred to the buyer anymore and thus stays with the provider (Tukker, 2004). In this type of PSS business model, the product is available under renting or leasing forms.

The last PSS business model category is result-oriented (RO). In this case, the company agrees with the customer/business about a performance outcome. Generally, a fixed price is determined which fully depends on the performance delivered by the product and/or service. Within this business model transformation, the product or service itself becomes less relevant for the buyer.

In order to align the product-service system theory with the in section 2.1. described theory about business models, a component-based as well as a transaction-based business model view on PSS is clarified.


### 2.3.1. Component-based business model view on PSS

Literature research is carried out to find the areas of importance in transforming from product-centric business models to each of the three PSS business model types (Tukker, 2004). These areas, relative to the pure-product ("Traditional Pipeline") business model, are summarized in table 2. The nine building blocks Business Model Canvas (Osterwalder et al., 2010) is used to divide the PSS business model literature into relevant areas.

<table>
<thead>
<tr>
<th>Building block/PSS type</th>
<th>Product-Oriented PSS</th>
<th>Use-Oriented PSS</th>
<th>Result-Oriented PSS</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Customer Segments</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Customer wants full ownership of the product and high independency (Tukker, 2004)</td>
<td>Customer is just interested in the use of the product (Tukker, 2004)</td>
<td>Customer is not interested in the ownership of the product (Lindahl et al., 2009)</td>
<td></td>
</tr>
<tr>
<td>Focus on sharing expertise in support and maintenance of the product (Helander &amp; Moller, 2008)</td>
<td>Total solution without high initial investment (Tukker, 2004)</td>
<td>High flexibility to change for the customer (Lindahl et al., 2009)</td>
<td></td>
</tr>
<tr>
<td><strong>Value Proposition</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Limited customization (Azarenko et al., 2009)</td>
<td>More durable design (Evans et al., 2007)</td>
<td>Ownership is not important for the customer (Cook et al., 2006)</td>
<td></td>
</tr>
<tr>
<td>Product should be easy to maintain &amp; Full maintenance contracts to guarantee product performance availability (Sundin and Bras, 2005)</td>
<td>Customization for large customers (Azarenko et al., 2009)</td>
<td>PSS provider is free in how to produce and deliver the result (Baines et al., 2007)</td>
<td></td>
</tr>
<tr>
<td>Optimizing customers processes by taking over the operation management (helander et al., 2008)</td>
<td>Higher flexibility for the customer &amp; Leasing/Renting/Sharing (Tukker, 2004)</td>
<td>High flexibility and customization (Azarenko et al., 2009)</td>
<td></td>
</tr>
<tr>
<td><strong>Channels</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Intense customer interface (Azarenko et al., 2009)</td>
<td>Influence customers attitude towards ownerless consumption (Baines et al., 2007)</td>
<td>Developing trustworthiness to convince customer about quality and reliability (Baines et al., 2007)</td>
<td></td>
</tr>
<tr>
<td>Clear communication of the additional services advantages &amp; Advice in customized service packages (Sundin et al., 2010)</td>
<td>Easier to manage compared to selling complex products &amp; A web based collaboration platform (Barquet et al., 2013)</td>
<td>Direct &amp; Intense communication with the customer (Barquet et al., 2013)</td>
<td></td>
</tr>
<tr>
<td><strong>Customer Relationships</strong></td>
<td>Based on warranty agreements contracts &amp; High standardization (Azarenko et al., 2009)</td>
<td>Contract should be built on customers demand and abilities &amp; High interaction with customer (Azarenko et al., 2009)</td>
<td>Very low on formalization (Meier et al., 2010)</td>
</tr>
<tr>
<td>Improvements by periodic product evaluations &amp; Long-term relationships based on trust and cooperation (Sundin et al., 2010)</td>
<td>High benefits by using customer data (tukker, 2004)</td>
<td>High complexity of the contracts &amp; Data can improve innovation speed largely (Azarenko et al., 2009)</td>
<td></td>
</tr>
<tr>
<td>Revenue Streams</td>
<td>Sales of traditional selling of the product (Van ostaeyen et al., 2013)</td>
<td>Service revenue generated by # working hours and x number of materials, or through a full service contract (Azarenko et al., 2009)</td>
<td>Revenue based on the availability of the product/service &amp; Revenue based on the time a product/service was in operation (Van Ostaeyen et al., 2013)</td>
</tr>
<tr>
<td>-----------------</td>
<td>---------------------------------------------------------------------</td>
<td>-----------------------------------------------------------------------------------------------------------------</td>
<td>----------------------------------------------------------------</td>
</tr>
<tr>
<td>Key Resources</td>
<td>Material, energy and information (Oliva et al. 2003)</td>
<td>Material, energy and information &amp; The monitoring system data &amp; Additional human resources for managing operations &amp; High need for additional financial resources (Tukker, 2004)</td>
<td>Material, energy and information &amp; The monitoring system data</td>
</tr>
<tr>
<td></td>
<td>Continuous product and service development (Barquet et al., 2013)</td>
<td>Activities related to financing General key activities</td>
<td>Training selling team (Baines et al., 2007)</td>
</tr>
<tr>
<td>Cost Structure</td>
<td>Traditional product costs &amp; Additional costs for materials and Human Resources &amp; Transition costs to PSS (Tukker, 2004)</td>
<td>High need for capital since the ownership stays with the provider (Tukker, 2004)</td>
<td>A high need for capital since the ownership stays with the provider (Tukker, 2004)</td>
</tr>
<tr>
<td>Key Partnerships</td>
<td>A streamlined flow between the provider and the service delivery partner (Azarenko et al., 2009)</td>
<td>A streamlined flow between provider and service delivery partner (Gao et al., 2011)</td>
<td>Close collaboration with the network partners &amp; PSS development together with the end-user (Halme et al., 2006)</td>
</tr>
<tr>
<td></td>
<td>Close interaction between manufacturer, service provider and customer (Tukker, 2004)</td>
<td>Extending partnership with financial institutions (Azarenka et al., 2009)</td>
<td>More personal in nature communication (Ng et al., 2009)</td>
</tr>
<tr>
<td></td>
<td>Support information sharing by using web-based platforms (Schuh et al., 2008)</td>
<td>A web-based collaboration platform to exchange information between partners &amp; Strategic integration with partners and stakeholders</td>
<td>Strategic integration with partners and stakeholders</td>
</tr>
</tbody>
</table>

Table 2: Component-based business model view on PSS

2.3.2. Transaction-based (platform) business model view on PSS
Relationships with external partners are very important in order to ensure PSS business models are implemented successfully (Baines et al., 2007). The creation of an ecosystem platform around a product-service system requires thorough identification of the actors and of the core competencies
they can provide (Mont, 2002). By describing a case study of developing sustainable PSS in the food sector, Evans et al. (2007) showed a good PSS can be achieved using platforms and partnerships during its development. The term platform, in this case, refers to the core base of a product architecture that enables customization. It is important to identify the value of each ecosystem partner throughout the product lifecycle (Sakao, Sandstrom & Matzen, 2009) when designing partnerships. Understanding the components of the business models of the companies in the network could support this identification.

Next to the basic ecosystem which consists of the collaborating partners, coordination mechanisms as well as communication channels should be defined clearly throughout the phases of the product lifecycle, to share the right information efficiently in the ecosystem (Schuh, Klotzbach & Gaus, 2008). Reim et al. (2014) mentioned that the most relevant activities, based on existing literature, discussing the PSS network are the type of partners, type of relationships and sharing and coordination activities.

However, in this research, the PSS literature is combined with a more platform-type business model view. As discussed earlier in this chapter, such a platform-type business model belongs to the transaction-based business model view. Research on the combination of these two research topics is rare. Only, Nishino et al., (2013) combined PSS with the platform business model literature in the Forty-sixth CIRP Conference of Manufacturing Systems. They defined a platform-type product-service system as a ‘Fusional system comprising product components and service components that are in complementary relation and which create no value with single use, especially having a common platform which makes service components functioning; it is finally provided to customers as an integrated total system’ (Nishino et al., 2013).

The product-service system components of the evaluated cases in this report have a complementary relation, and are offered to the customer as an integrated platform. Therefore, the definition by Nishino et al., (2013) of a platform PSS will is used in this research.
3. Research Methodology

This project aims to search for emerging patterns and key learnings of platform-type business models for product-service systems. A major distraction made in advance is the openness of the ecosystem platforms to permit third-party developers to add value to the platform. The research was conducted in a product-centric firm. Different appropriated research methods can be distinguished, including explanatory, exploratory and descriptive studies, which can be applied for various purposes (Yin, 2014; Blumberg, Cooper & Schindler, 2011). This research is classified as an exploratory research. The objective is to identify concepts, understanding mechanisms, and to develop new theory concerning open versus closed ecosystem platforms for product-service systems.

3.1. Multiple case-study research method

Many emerging topics come together in this research, namely, product-service systems, business models, business ecosystems and platforms. In addition, the scope of this project contains product-service systems developed in a product-centric company. Furthermore, current literature still lacks insights into the patterns of platform-type product-service systems business models at product-centric firms (Ostrom et al., 2010). Therefore, due to this specific context, qualitative collection methods are used during this exploratory research project.

In order to answer the exploratory oriented research questions, a multiple case-study research approach is will be used (Eisenhardt, 1989). Since many models, frameworks and conceptual ideas already exist in this research field, this research is best characterized as theory elaboration (Lee, Mitchell & Sablynski, 1999). This research builds further on theory of platform-type business models in the context of product-service systems. Theory elaboration is similar to theory generation with procedures defined by Eisenhardt and Graebner (2007). In addition, a case-study research approach is appropriate in this case because it is a useful design when the aim is to understand more about the process (Bryman, 2008). In order to avoid premature closure, an open research attitude is used. To find emerging patterns and to identify key learnings of the choices made in the business models and business ecosystems, a process research approach is adopted in this research (Langley, 1999).

Selecting cases is done using a purposeful sampling strategy to identify and select information-rich platform-type PSS cases (Eisenhardt, 1989; Patton, 2002). The possible cases to select were all at different divisions of Royal Philips N.V. where the research took place. Philips is a product-centric firm which is currently in an innovation process to become more customer-centric (see chapter 1). They are investing lots of resources in developing their service capabilities in order to create successful product-service systems. These product-service systems require radical changes and a more ‘open’ approach in cooperation with partners (see chapter 2). Chesbrough and Garman (2009) considered Philips as a frontrunner in the use of such open business models.

The first criteria to select cases was the nature of the product-service system. As described in section 3.2, Tukker (2004) identified three types of product-service systems wherein the value ratio variates between the product and service component. Cases were selected with a high dependence between the product and service component of the product-service system. This means that the PSS components create little value with single use (Nishino et al. 2013). Therefore, there should be a significant amount of value in the service component as well as in the product component of the PSS. This is because of the fact that a product-oriented product-service system, of which the value is mainly in the product component, does not require radical business model changes. Therefore, the case studies selected for this research are product-service systems requiring radical new business models compared to ‘traditional’ pipeline business models.
Second, the selected cases had to be available for the customers or end-users for at least four years, and have undertaken a radical business model innovation process compared to the traditional pipeline business model. Many product-service systems at Philips are still initiatives, and therefore not ready to enter the market. Such cases are less useful for this research because in most cases the business development, including the business model and the business ecosystem, is not yet finished or not even started.

Third, the cases had to be developed in different divisions of Philips in order to prevent that the business development process was done by the same business developers. In addition, the business initiatives had to be not only new to the firm but also new to the sector. That makes the business development a more challenging endeavor with limited opportunities to imitate other firms (Rivkin, 2000).

To select appropriate cases, six interviews have taken place to identify cases that meet the defined criteria. These respondents consists of five senior consultants, and one managing consultant of Philips Industry Consulting. In addition, the available data per case were inventoried in order to estimate the required time for the research.

The following cases were selected; DirectLife, Medido, CityTouch and Hue (see table 3). All these cases have a high product-service dependency as explained in criteria one in this section. In order to answer the research question, two of the four cases contain a more open platform where third-party developers can add value to the platform. The other two cases are closed platforms. The four cases will first be evaluated as stand-alone entities (Eisenhardt, 1989), this process allows the unique patterns of each case to emerge before finding general patterns across cases. This familiarity with each case will accelerate the across-case comparisons in order to answer the research question. The overall idea behind these cross-case comparisons is to force investigators to use structured and diverse lenses on the data (Eisenhardt, 1989).

<table>
<thead>
<tr>
<th>Internal PSS case</th>
<th>Short description</th>
</tr>
</thead>
<tbody>
<tr>
<td>DirectLife</td>
<td>DirectLife is a personalized health program which makes people aware of their exercise habits and helps them with responsible and viable goals. The portable Activity Monitor registers the movements, and the data will be visible on a personal webpage that keeps track of your progress.</td>
</tr>
<tr>
<td>Medido</td>
<td>Medido is a smart medication management service which works with a full automatic issuance system, drug roles, and a special e-health platform. It makes sure that patient receive the right medication on the right time.</td>
</tr>
<tr>
<td>CityTouch</td>
<td>CityTouch is an outdoor lighting control platform. It easily optimizes public lighting in terms of livability, energy-efficiency and decrease of operational costs. The CityTouch services provides control of the light park and operational costs.</td>
</tr>
<tr>
<td>Hue</td>
<td>Hue is a lamp with a diverse range of colors. Hue consists of a Hue-bridge which is a bridge between the lamps and the smartphone-application. By the application consumers can control the lights (switch on/off, change colors). Hue has partnered with third-party developers in order to increase the number of services.</td>
</tr>
</tbody>
</table>

Table 3: Case-studies

3.2. Data Collection

The data collection focused on understanding the both the component-based and the transaction-based business model view of each case, including the rationale behind the major decisions which have led to significant changes. Semi-structured interviews were the primary data source because it allows
to get insights into research topics where a small amount of information exists. Data coming from websites, newsfeeds, presentations and other documents were collected and used to triangulate the data coming from the interviews to enhance validity (Yin, 2008).

First, for each case, one senior innovation consultant of Philips Innovation Services who was involved in the business development process of that particular case was interviewed. The purpose of this interview was to sketch the business model and business ecosystem, and to track business model related changes and developments. In addition, names of ‘colleagues’ were asked who played a central role in the business development of that particular case. Furthermore, the consultants were asked to share additional data sources in order to triangulate the data coming from the interviews. Next to that, these additional sources were used to prepare additional interviews.

After each interview with a senior innovation management consultant, the business model and business ecosystem were visualized using the Business model Canvas (Osterwalder et al., 2010), and the value modeling tool (Philips Industry Consulting, 2014). These models were showed and validated at the beginning of each interview with a respondent from that particular case. Possible changes or mistakes were corrected immediately after each interview. Thereafter, the improved models again were validated with the next respondent of that particular case.

At least two respondents per case were interviewed to get a complete view of the business model and business ecosystem related changes, including the platform development (open versus closed). See table 4 for all the interview respondents including their function in the organization.
<table>
<thead>
<tr>
<th>Respondent</th>
<th>Interview category</th>
<th>Case</th>
<th>Function</th>
<th>Duration</th>
</tr>
</thead>
<tbody>
<tr>
<td>Respondent 1</td>
<td>Orientating</td>
<td>-</td>
<td>Managing Consultant</td>
<td>45 min</td>
</tr>
<tr>
<td>Respondent 2</td>
<td>Orientating</td>
<td>-</td>
<td>Senior Consultant</td>
<td>45 min</td>
</tr>
<tr>
<td>Respondent 3</td>
<td>Orientating</td>
<td>-</td>
<td>Senior Consultant</td>
<td>30 min</td>
</tr>
<tr>
<td>Respondent 4</td>
<td>Orientating</td>
<td>-</td>
<td>Senior Consultant</td>
<td>45 min</td>
</tr>
<tr>
<td>Respondent 5</td>
<td>Orientating</td>
<td>-</td>
<td>Senior Consultant</td>
<td>45 min</td>
</tr>
<tr>
<td>Respondent 6</td>
<td>Orientating</td>
<td>-</td>
<td>Senior Consultant</td>
<td>30 min</td>
</tr>
<tr>
<td>Respondent 7</td>
<td>Exploring</td>
<td>Medido</td>
<td>Senior Consultant</td>
<td>45 min</td>
</tr>
<tr>
<td>Respondent 8</td>
<td>Exploring</td>
<td>Hue</td>
<td>Senior consultant</td>
<td>60 min</td>
</tr>
<tr>
<td>Respondent 9</td>
<td>Exploring</td>
<td>CityTouch</td>
<td>Senior Consultant</td>
<td>60 min</td>
</tr>
<tr>
<td>Respondent 10</td>
<td>Exploring</td>
<td>DirectLife</td>
<td>Senior Consultant</td>
<td>60 min</td>
</tr>
<tr>
<td>Respondent 11</td>
<td>In-depth</td>
<td>CityTouch</td>
<td>Integral project manager outdoor lighting</td>
<td>60 min</td>
</tr>
<tr>
<td>Respondent 12</td>
<td>In-depth</td>
<td>DirectLife</td>
<td>Senior Scientist (Member DL Venture)</td>
<td>60 min</td>
</tr>
<tr>
<td>Respondent 13</td>
<td>In-depth</td>
<td>Hue</td>
<td>System architecture manager</td>
<td>75 min</td>
</tr>
<tr>
<td>Respondent 14</td>
<td>In-depth</td>
<td>Medido</td>
<td>Senior Consultant Care Management</td>
<td>90 min</td>
</tr>
<tr>
<td>Respondent 15</td>
<td>In-depth</td>
<td>Medido</td>
<td>Senior Consultant</td>
<td>30 min</td>
</tr>
<tr>
<td>Respondent 16</td>
<td>In-depth</td>
<td>CityTouch</td>
<td>Global program manager systems</td>
<td>120 min</td>
</tr>
<tr>
<td>Respondent 17</td>
<td>In-depth</td>
<td>DirectLife</td>
<td>Consumer Marketing &amp; Services Director</td>
<td>45 min</td>
</tr>
<tr>
<td>Respondent 18</td>
<td>In-depth</td>
<td>CityTouch</td>
<td>Product Manager Global Outdoor Systems</td>
<td>60 min</td>
</tr>
<tr>
<td>Respondent 19</td>
<td>In-depth</td>
<td>Medido</td>
<td>Business Manager Medication Management</td>
<td>30 min</td>
</tr>
</tbody>
</table>

Table 4: Interview respondents

At the beginning of all the in-depth interviews, the major findings of earlier interviews including the models were checked in order to mitigate potential biases of individual respondents (Gibbert et al., 2008). In addition, the respondents were asked to explain their personal background and role in the particular case. All the interviews were recorded and transcribed verbatim. The interviews were all conducted between March and June of 2015.

The interviews were semi-structured to enhance reliability (Yin, 2008). A protocol with ‘standardized’ questions was used with the openness to ask additional, more in-depth, questions on case specific relevant subjects (see appendix II). These semi-structured interviews also provided freedom to ask respondents for further detail (Aken, Berends & Bij, 2012). Especially business model elements with major differences compared to the components of their preexisting business models received the most attention. The questions together with the semi-structured interview style aimed to undercover major business model related decisions and challenges. As described earlier, in order to triangulate the interview data, all the other available data such as business plans, presentations etc. was used (Jick, 1979). In addition, these additional data sources together with the exploring interviews helped to prepare the interviews which allowed to make best use of the interview time.
The following table shows the additional data used per case. These additional data sources are Philips restricted so not included in the appendices.

<table>
<thead>
<tr>
<th>Case</th>
<th>Additional data:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hue</td>
<td>- Business case&lt;br&gt;- Business presentation about the final product&lt;br&gt;- Business presentation about the platform ecosystem&lt;br&gt;- Philips internal newsfeeds</td>
</tr>
<tr>
<td>CityTouch</td>
<td>- Business presentation CityTouch Client&lt;br&gt;- Several CityTouch brochures&lt;br&gt;- Business Case</td>
</tr>
<tr>
<td>DirectLife</td>
<td>- A previous master thesis with Philips DirectLife as single case-study&lt;br&gt;- An Interview transcript of an interview of another student with a founder of DirectLife</td>
</tr>
<tr>
<td>Medido</td>
<td>- A report with results of a Medido Pilot&lt;br&gt;- Business case Medication Management&lt;br&gt;- Medido installation process flow documents</td>
</tr>
</tbody>
</table>

Table 5: Additional data sources per case

3.3. Data Analysis

The first step of the analysis contains within-case analysis to describe the business model and business ecosystem including the most important changes for each case separately (Eisenhardt, 1989). To do this properly, the interviews were coded with a label for each component of the Business Model Canvas (Osterwalder et al., 2010). All the text involving information about the actors of the business ecosystem including the value flows were labeled. By combining all the quotes per business model component label, the business models, business ecosystems are described and strengthened with quotes.

As the second step in the within-case analysis, unique patterns were identified in the business model. These combinations of business model patterns enable comparisons between the business models. The Business Model Canvas as well as the value modeling tool do not enable proper comparisons between the models. The 55 business model patterns of the St. Gallen Business Model Navigator were used as coding labels (Gassman et al., 2014). These 55 patterns were defined as a result of a five year during research where 250 business models have been analyzed. Eventually, a summary of the combination of unique patterns of each business model is given.

The last step of the within-case analysis involved the search for key learnings and conclusions. Because of the reason that all the cases appear in different business units of Philips, the within-case learnings and conclusions contains valuable practical information. In addition, it gives a rich familiarity with each case which, in turn, accelerates cross-case comparisons (Eisenhardt, 1989).

Furthermore, cross-case analysis is carried out to find unique cross-case patterns (Eisenhardt, 1989). The identified business model patterns provide a proper basis for cross-case analysis. It provides a good view of the within-group similarities and intergroup differences. Thereafter, two major dimensions were identified to structure the cross-case analysis. One of the two dimensions is open versus closed platforms which splits the cases in two by two. This dimension is important for elaborating on existing theory and to answer the research question. The second dimension is PSS to organization versus PSS to consumer which answers the question if the customer segment of the business is another business or a consumer. This dimension also splits the cases in two by two.
Eventually the cross-case differences and similarities within, and between the two dimensions were compared to the extant literature. Here a broad range of literature is used namely literature concerning product-service systems, business models, business ecosystems and platform (ecosystems). Main questions were; what is similar to, what does it contradict, and why? (Eisenhardt, 1989).

3.4. Development Practical Tool

In order to increase the practical use of the research results, an easy to use PowerPoint tool is created with the use of hyperlinks. This tool will combine an overview of the 55 business model patterns (Gassman et al., 2014), case examples and the thesis results about open versus closed platforms (See Appendix VII for the navigation slide). In addition, next to the four Philips case-studies, other external cases are developed and included in the tool. These cases also consists of an platform-type business model which makes comparisons with the Philips cases possible. The external cases are: Nespresso, Tesla, Airbnb, Nike plus, Zipcar, Apple iTunes/iPod, Amazon Kindle and Wii.

For every case, the component-based business model view as well as the transaction-based business model view is given. In addition, a short description including some facts and figures is given. Furthermore, the corresponding business model patterns are listed which makes comparisons with the other case examples as well as with the Philips cases possible. This tool can be used as a source of inspiration for development of platform-type business models for product-service systems.
4. Results within-case analysis

In this chapter, the unique patterns and learnings for each case are analyzed and described. First, a general description for each case study is given. Second, the business model, including the important business model changes is described for each of the nine Business Model Canvas building blocks. Third, the business ecosystem, including the important changes, are described and analyzed by the Value model tool (See chapter three for more information). Finally the unique patterns, and case-specific learnings are summarized.

4.1. Hue

Philips Hue is a wireless LED system with lightbulbs with a wide range of all the colors in the spectrum. The heart of the Hue system is the ‘bridge’ which is literally a bridge between your app and the Hue lightbulbs. The bridge is linked to wi-fi via a router. It also connects your system to the wider world. The lights are also controllable with the app outside the home via the Hue IT services which connects the right phone to the corresponding bridge.

Mobile phone applications (apps) are the key to controlling the Hue. The apps can change the colors, brightness, functions and everything else in between of the Hue system.

With the Hue system, Philips created an open platform which gives app-creators the freedom to create apps compatible for the Hue. In order to accelerate the growth of the platform, Philips provides new features to expand the Hue system. Examples of these upgrades are the Hue Bloom, Hue LightStrips and the Hue Go. On top of that, Philips puts a lot of energy in creating partnerships with companies that have complementary products for the Hue system. For example, they agreed a partnership with ‘the Learning Thermostat’ by Nest to enhance the value proposition. This thermostat is controllable via an app and the Hue bridge.

4.1.1. Component-based Business Model view Hue

The business model for Hue, including important changes and choices is described in this section. Some quotes are used to strengthen the business model explanation. See appendix III for an overview of all the quotes used to describe this business model. The ‘Key partners’ are described including the value streams of the complete business ecosystem in section 4.1.2. See Appendix V for the complete Business Model Canvas for the Hue.

Customer Segments

The major focus of the Hue is on residential people. Since 2013, they also started to aim for small businesses such as hotels, restaurants, bars etcetera.

Value Propositions

The value proposition is a connected light system with multicolor lights. The distinctive value is based on the colors in combination with the various apps that provides the ability to create a unique atmosphere. Next to that, there are many applications, upgrades and add-ons from third-party developers in order to expand the system, and therefore, increasing the level of experience.

Channels

Finding a Channel to sell the Hue packages was not easy in the beginning. This is mainly because the Hue is relatively expensive, and consumers did not feel the drive to buy Hue lightbulbs. It is a luxury product because normal (single-color) LED-lightbulbs can be bought for approximately 1/8e of the price of a Hue LED-lightbulb. Therefore, they made the decision to give Apple the exclusivity to be the
only Channel for the Hue. The reason to do this was because Apple is able to explain the value of luxury products to people, and therefore make it a success.

“Latent desire, which is very hard to communicate. And that’s the problem with our product. There is no awareness, there is no drive for consumers for it. It is extremely desirable if you getting to understand it. So what we were actually looking for, was where can we sell this product? Who really can explain it to people? And where can we sell it somewhere where it immediately gets credibility. Luckily Apple supported our vision.”

After six months of having the Apple-store as an exclusive channel, other more regular channels of Philips products start to ask Philips if they could get the permission to sell the Hue. From that point, Philips started selling the Hue also by other (regular) Online and offline (Physical stores) channels. Through this way, the Hue was promoted to other channels by Apple.

Customer Relationships

The relationship between Hue and their customers is maintained and reinforced in several ways. The first way is by making existing customers continuously aware of new functions and features.

“A major thing that happens in our system, and which you don’t have in typically products (at Philips). Is that we have an ongoing customer relationship with the customers to make them constantly aware of new functionalities, features and new product launches. So we are trying to build this ongoing dialogue with them to get them to use lighting in richer ways. And as a result of that actually, a major source of sales is that people extending their systems. We’ve got this inspiration from the razor-blade model by Gillette”

Secondly Philips facilitates a Hue community where users can share their experiences with the Hue system, and help each other by asking and answering questions. Philips uses the data to improve the products and app-services. They also use this group of early adopters to test new functions and features before they come on the market. However there is one challenge, namely, that early-adopters are not representative for the whole customer group. There are also a lot of customers who are not interested in the new functionalities, and therefore are not actively participating in the Hue community. The following quotes underlines this; “We’ve paid agencies a lot to do consumer/market research. But these people in our own community will do it actually for free. The issue is a little but, these people are not representative for the whole target group. The people in the community are just early adopters, which is our current installed base. We have made some missteps, where we made some changes for example in the app which everyone hated. And that we could have solved by asking our early adopters in the community”

“We facilitate the Hue community, We use the data, and share the things they have created. We facilitate, help and promote”

A third way is to work together in joint marketing campaigns with third-party hardware developers such as Nest, also in stores they do joint merchandising to help promote the combination.

Revenue Streams

The only revenue stream is still the revenue from hardware sales. So from the Hue starters packages, sales, and from the Hue upgrade sales. The service proposition is meant to get more use-cases and eventually to increase the hardware sales.

“We don’t get service revenue, we get money from hardware sales. But actually we do provide the service to our customers, we give it away for free. So we sell our hardware bundled with services. Which is actually, we maintain an ecosystem which continuously give you more use cases. And the way we actually monetize the services, is that it drives additional system sales”
From the moment that the installed base is big enough to periodically monetize the service, than they will consider asking a monthly fee for ‘high valuable’ services. For example a security service which connects with a security business partner.

“I believe at a certain point, you will have a big enough installed base, that it sells itself, we can do that. And create a new revenue stream”

Another issue is that a product-company is very asset heavy which makes it less interesting to make monthly service revenue compared to a pure service company.

“We are a very asset-heavy. To cover all the assets, we have to make big revenues. A service business has very high profitability and very asset light, very few people and very few component assets. It’s fine to not make that much money for a service business because you have for example 80 percent margin”

Key Resources

Next to the more ‘standard’ key resources for a product-centric company (e.g. Marketing employees, sales employees, material suppliers etc.), Hue uses the data from the Hue community as a resource for product and service improvement.

Key Activities

In order to keep the Hue platform running and regularly launch new functions and features, many activities have to be performed. The main activities consists of developing system hardware upgrades and software updates to increase the hardware sales. In addition, this provides app creators more possibilities for creating new apps for Hue.

“It’s not just our app, we have opened the app, so there are a lot of third-party apps which attract people to develop more”

Next to that, Partnering activities with third-party developers like with Nest, are an important main activity to increase the growth of the Hue business ecosystem and therefore the platform. In addition, these new third-party developers also provide new reasons for the app creators to create new apps with new functions.

“Yes but also, we launched the hue tap, and build some features in our app, which lead to 15 new apps launched which can do more sophisticated things which were only enabled by launching that new system feature. So we help to promote these applications”

The last main activity is an innovation activity in order to get the price of the Hue-lightbulbs down. This is challenging because of the reason that also less expensive lightbulbs should be able to reach all the colors of the spectrum. Otherwise, the system is not consistent anymore.

“The lights are very innovative, but the purchase price should be way lower in order to attract a larger customer base. At the moment, we put lots of efforts in lowering the costs of the Hue lights”

Cost Structure

The cost structure roughly consists of two parts. The first part contains of the production, shipping and marketing/sales costs belonging to the more standard costs of a product-centric firm. The second part consists of the costs that have to do with the services. These costs are IT-service costs needed to match the right phone to the right bridge, and costs for cloud and web providers to keep the service working. Finally, the service updates with new functions and features is also a significant expenditure.
“We also have noted that offering the service is very expensive. We don’t directly monetize, but it is expensive. I would say, if we look at the cost price, 75 percent is hardware shipping etcetera, and 25 percent is the costs of operating the service”

“I mean, also providing the service and adding features, we spent 10 million plus a year on adding features”

4.1.2. Transaction-based Business Model view Hue
In this section, the business ecosystem of the Hue is explained. In order to increase the distinctness of the model, only the most important partner roles and value flows are shown. The complete model with all the partners and value flows is included in Appendix VI. The PSS platform of Hue is shown in figure 2.

The left square consists of the Hue itself, the complementary hardware provider and the app creator ‘role’. Combined with the Hue IT service, these partners provide the Hue PSS platform. Philips connects and licenses the app creator and the complementary product providers to allow them to create value on the Hue platform. Customers can buy the apps from the app creators via app stores. The app creator receives a percentage of the purchase fee per app. The amount of percentage of the fee the app creators receive depends on which smartphone platform the customer is using.

The square on the right side of the model shows the Hue community. Here customers can exchange experience with other customers. Hue facilitates this community and uses the data for product and service improvement.

Figure 2: Platform Ecosystem Hue
In this PSS platform, the value of the service component is created to increase the usability and functionality of the product. In addition, the service component is developed to make the Hue system a fast growing platform, where Philips tries to accelerate the speed by continuously adding new functions and features. The following quote describes the idea behind this business model: “The idea with this platform based ecosystem, is that they become self-sustaining. So what we do, is the third party apps give use-cases to the customer. And as we increase use cases by adding new functions and features, it makes the system more desirable which in addition increases the system sales.”
This quote from another respondent confirms this platform business model view of the Hue: “The interesting about it is, is this gives us a bigger installed base which attracts more third party developers and more third party apps, this meant to be a self-sustaining cycle. What we do in order to accelerate the speed, is that we inject features, which enable new kind of applications and make the user aware of these. We monetize out of this by doing more system sales.”

4.1.3. Business Model patterns Hue

The following patterns are identified in the business model of the Hue. See Appendix IV for a short general description of the patterns used in this report according to the St. Gallen Business Model Navigator.

<table>
<thead>
<tr>
<th>Business Model pattern</th>
<th>Explanation (Philips Hue)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Digitization</td>
<td>The way to control the lights (via app/phone) is a digital variant of the regular switches. The advantages compared the regular switches are faster and easier control over (all) the lights, and outside the walls of the house.</td>
</tr>
<tr>
<td>Leverage customer Data</td>
<td>New value is created by collecting customer data from the Hue community by analyzing it for (new) functions and features improvements/ideas.</td>
</tr>
<tr>
<td>Peer-to-Peer</td>
<td>By offering the community, they created a place where individuals (early-adopters in this case) cooperate with each other by sharing information and activities.</td>
</tr>
<tr>
<td>Add-On</td>
<td>Hue provides regularly new upgrades (add-ons) to expand the Hue system. Also new apps and partnerships with third-party developers can be seen as add-ons on the system.</td>
</tr>
<tr>
<td>Mass Customization</td>
<td>By offering a platform with different apps, function, upgrades and third-party subscriptions (like Nest); the Philips Hue makes customization possible.</td>
</tr>
<tr>
<td>Open Business Model</td>
<td>The Hue collaborates with many partners (app creators, third-party subscriptions) in order to create more value, and make the Hue a platform of choice</td>
</tr>
<tr>
<td>Open Source</td>
<td>The source code to make apps for the Hue including complementary products is open. Thereby third-party app developers can create apps for the Hue system.</td>
</tr>
<tr>
<td>Lock-In</td>
<td>Philips is continuously bringing upgrades on the market which enlarges and personalizes a Hue system. When a Hue system is purchased, customers face relatively high lock-in costs in case of switching to another system</td>
</tr>
<tr>
<td>Revenue Sharing</td>
<td>Third-party developers, or new apps with new features lead to more system sales and eventually in a bigger installed base. A bigger installed base will eventually lead to more app, and hardware sales of the app creators, and third-party subscriptions.</td>
</tr>
<tr>
<td>Two-sided market</td>
<td>Two-sided markets facilitate interaction between two complementary groups for mutual benefits via a platform. In this case, the Hue platform, facilitates on the one hand interaction between app-creators and customers. And on the other hand between complementary goods providers and customers.</td>
</tr>
</tbody>
</table>

Table 6: Business Model Patterns Hue
4.1.4. Conclusions and key learnings Hue-case

The Hue is a partly open platform product-service system where the service component is completely open for third-party developers. The product component is basically closed. However, to achieve a bigger, more complete, platform; value of complementary products can be added to the platform. Opening the service component ‘completely’ means in this case that there are no restrictions for creating apps (software) for the Hue.

Without restrictions, app developers have the ultimate freedom to create apps and explore new opportunities to create value for and with the Hue system. However, the control over the quality and the real ‘value’ of the service component is largely lost. In order to prevent that people will download low-quality apps, Hue views the apps they like on the website.

The complete value of the Hue system depends on the installed base (i.e. the number of customers using a Hue system at home). The reason to open the service component, is to increase the value for the Hue. The more the value of the system increases, the more reasons for potential customers to purchase a starters package. In addition, upgrades of the Hue and complementary products from third-party developers increase the possibilities for apps. The idea behind this, is that the PSS platform becomes ‘self-sustaining’ and continuously growing.

In the beginning, the app-developers are hobbyists, because professional app developers only see opportunities when the installed base is large enough in order to generate profits. These profits can come from app-sales, but also from more subscription-based professional payed services. However, before the installed base will reach that minimum size of the installed base, the costs that have to do with the service are significantly high and can only be earned back by hardware sales. Therefore, a partly open platform requires high investments.

The switching costs, due to the lock-in effect are relatively high for the customer. Switching to a home lighting management system from another company costs money due to the required hardware changes. In addition, customers have to deal with new software which costs significant effort. The combination of being the first one with such a system in combination with a lock-in pattern have a positive effect on the installed base. The add-on elements strengthen this position by offering upgrades on the existing Hue system. By adding additional hardware to the system, a customer will increase the switching costs, and thus decreases the probability to leave the installed base.

Hue decided to create and fund a Hue community platform where users can share experiences with the Hue system. Instead of funding an expensive helpdesk, Hue participates actively in the Hue community. They do this by answering users questions about the possibilities and ways to install the Hue system in combination with extensions from the Hue itself and from third-party developers. This way Hue can learn immediately from its early-adopters, and use the customer-data to improve the Hue products and services. They will use the Hue community even stronger in the future to prevent creating updates which people do not like.

4.2. DirectLife/ActiveLink

DirectLife/ActiveLink is a product-service system that consists of an activity monitor and a personal coaching service. The activity monitor registers the movement throughout the day which can be reviewed by the personal coach and the user. In addition, the user can ask questions about his lifestyle and activity patterns to the coaches. The coaches subsequently give advice in order to improve the healthy lifestyle of the user.
In 2012, DirectLife agreed on a partnership with WeightWatchers, and therefore, the name changed to ActiveLink which has led to a radical business model change. Section 4.2.1. will expand on this business models of DirectLife and ActiveLink, and on the reasons to change.

### 4.2.1. Component-based Business Model view DirectLife/ActiveLink

The business models of DirectLife and ActiveLink, including important changes and choices is described in this section. Some quotes are used to strengthen the business model explanation. See appendix III for an overview of all the quotes used to describe this business model. The ‘Key partners’ are described including the value streams of the complete business ecosystem in section 4.2.2. See Appendix V for the complete Business Model Canvas of DirectLife and ActiveLink.

#### Customer segments

The target customer segment consists of people who want to improve their lifestyle through becoming more ‘active’ via personal advice. A test pilot with children confirmed their hypothesis that this PSS would be too boring for children. Therefore, the customer segment was limited to adults (18+).

#### Value Proposition

The value proposition of DirectLife consists of three main elements namely, measurement, monitoring and motivation (the three M model). Measurement comes from the hardware component, where the device records the movement during the day. Monitoring is done by the software side where a user can see its progress every day on his or her account. The motivation part is carried out by the coaches, who actively analyze and coach the users.

The following quote argues why coaching part (service part) is very important in this value proposition; “the 3M model came in super early. Only having measurement and monitoring would not create lasting change. There is always an “intention behavior gap”, where people want to make a change but they are not able to perform to do it”.

#### Channels

Finding appropriate channels that lead to the customer segment was a major challenge from the beginning. Increasing the installed base was important in order to become break-even as soon as possible. The device was relatively cheap so the most important part of the revenues should came from the (monthly) service fee. A B2B channel-approach was used to reach as much potential customers as possible. Therefore, they targeted Fortune500 companies to sell the activity monitor including three months of free service. This led to a major increase in the number of users. However, problems with targeting the right customers occurred despite the large growth. Next to the people who are interested in a healthier lifestyle, the people who did not needed or wanted it also received a device with three months of free coaching. The follow two quotes confirm this problem; “So rolling it out to all the employees; typically what happened is first you get the people who are already quit active, and thus don’t need the service. So that is an issue” and “Another problem is that you also have people that are not even aware that they need to get more active by themselves, we also got a lot of resistance from them”.

Eventually they decided to stop selling the PSS via the Fortune500 companies because there were too few users extending their subscription of DirectLife after the free months. Thereafter, they agreed on a partnership with Weightwatchers in order to find a channel which better reaches the target customers. Weightwatchers already had millions of users who are interested in a healthier lifestyle and therefore was a perfect channel for selling the DirectLife PSS.
Customer Relationships

In this case, the personal coach was the connection between the Philips and the user. “The working element of that model was the unlimited reactive coaching, which means that there is one coach who you talk to”. The coach reviewed the data of his or her clients, and actively approached them when they did not achieve their personal targets. The following quote underlines why the data coming from the activity monitor is useful for the coaches, “There is data monitoring to check if its correct that you don’t need it. Because you might think that you don’t need it but if the coaches see no movements, than he or she will sent a personal massage”

A problem DirectLife faced concerning their customer relationships, was the shortcoming of the general Philips consumer care helpdesk. That problem was due to the reason that Philips was not used receiving questions about a service component that did not work properly. This statement is underlined by the following two quotes. “But then you reach the organization which is product focused. Basically the helpdesk had two questions. The first: is it broken? And the second, do you still have warranty? For this type of products, the answer always was; replace the product” And “But the consumer service get calls like, well my activity monitor does not work. And an activity monitor doesn’t break. So then they get other problems, and have to get more into that. The consumer care of Philips had no idea what to do with that”

After the partnership with Weightwatchers, the customer relationship part was transferred to Weightwatchers because from that moment, the users were Weightwatchers’ customers. The Philips coaches were in close connection with a Weightwatcher leader who performed the actual relationship with the customer.

Revenue Streams

The revenue streams consists of an initial fee of 39 euro, and next to that a monthly fee of 5 euro for the coaching service. Since the partnership with weightwatchers, 50 percent of the monthly fee goes to Weightwatchers, and the other 50 percent to Philips.

The following quote underlines the reason why DirectLife chose a subscription-based revenue model. “And here the knowledge form the fitness center comes in. People have a subscription at a fitness center don’t cancel it. Because the moment they are thinking about cancelling it, they are going to the gym because they think of: this is ridicules, I have paid for six months, and I never went to the fitness school. So they go to the fitness school and pay for another six months”

Key Resources

Next to the more ‘standard’ key resources for a product-centric company (e.g. Marketing employees, sales employees, material suppliers etc.), Philips used the coaching data as a resource to automate the coaching advice. See ‘Key Activities’ for more information about the activity to automate the coaching service.

Key Activities

In addition to the personal coaching itself, the coaches filled in the complete coaching advice in a database. That advice was linked to a specific pattern of activity and personal goals. Through this, the coaches could use the database to copy coaching advice to other users with the same patterns. As a result, the ‘personal’ coaching became more efficient and automated. In addition, improving the activity monitor was a major activity.

After the partnership with Weightwatchers, the main activity of the internal Philips coaches became training the Weightwatchers leaders with coaching their Activelink users.
Cost Structure

The cost structure roughly consists of two parts. The first part contains the production, shipping and marketing/sales costs belonging to the more standard costs of a product-centric firm. The second part consists of the costs that have to do with the services. These costs are IT-service costs to keep the service working, and of the salary costs of the internal coaches.

4.2.2. Transaction-based Business Model view DirectLife/ActiveLink

In this section, the business ecosystems of the DirectLife and ActiveLink are explained. In order to increase the distinctness of the model, only the most important partner roles and value flows are shown. The complete model with all the partners and value flows is included in Appendix VI. See figure 3 for the platform of DirectLife, and see figure 4 for the platform of ActiveLink.

The DirectLife platform consisting of the hardware component (Activity monitor) and the service component ('digital' coaching) is organized within the following business ecosystem (see figure 3).

![Platform Ecosystem DirectLife](image)

**Figure 3: Platform Ecosystem DirectLife**

The platform of DirectLife, before the partnership with Weightwatchers, consists almost completely of integrated partners (e.g. the product component and the service component is fully owned by DirectLife and no direct partners are involved). Fortune500 Companies are in fact enablers in the platform, they are a business channel in order to reach many potential customers. After signing the subscription, the end-users will become direct customers of Philips. The company pays the initial fee and informs their employees about the activity monitor in combination with the coaching service. Next to this business channel, DirectLife is also sold directly to customers/end-users.

Via peer to peer marketing, other customers could be attracted who individually decide to buy the DirectLife system. The DirectLife coaches collect the data in order to fill the database and to automate the service.

The costs to keep this platform and ecosystem running are completely for DirectLife. Without other (business) partners, DirectLife finances the both components of the product-service system completely.

After the partnership with Weightwatchers (See figure 4), Directlife only kept its existing customers. From now on, only Weightwatchers will be used as a channel to sell the PSS. The Philips coach is partly
training the Weightwatchers leaders, and partly coaching users. Half of the subscription fee that Weightwatchers receives from the customers using the Activelink is paid to Philips. In fact, by this business model transformation, now DirectLife serves as a value creator on the Health-platform of WeightWatchers.

![Diagram](image)

Figure 4: Platform ecosystem ActiveLink

### 4.2.3. Business Model patterns DirectLife/Activelink

The following patterns are identified in the business model of the Philips DirectLife. See Appendix IV for a short general description of the patterns according to the St. Gallen Business Model Navigator.

<table>
<thead>
<tr>
<th>Business Model pattern</th>
<th>Explanation (DirectLife)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Digitization</strong></td>
<td>A personal coaching service done via a system with (automatic) messages instead of face to face coaching. This pattern is actually less dominant since the partnership with Weightwatchers because the coaching was transferred to the Weightwatchers leaders.</td>
</tr>
<tr>
<td><strong>Flat Rate</strong></td>
<td>The customer pays a fixed amount of money per month for the service. Therefore, he or she can use the service regardless of any actual usage or timer restrictions on it.</td>
</tr>
<tr>
<td><strong>Mass Customization</strong></td>
<td>With the combination of the product functionality in combination with personalized coaching, mass customization is enabled by the value proposition.</td>
</tr>
<tr>
<td><strong>Closed business</strong></td>
<td>Because the coaches were hired internally, DirectLife does not depend on suppliers, or other companies which resulted in a decrease in costs and an increase in the stability of value creation. Also this pattern became less strong since the partnership with Weightwatchers. From that moment, their business strongly depends on Weightwatchers.</td>
</tr>
<tr>
<td><strong>Leverage customer data</strong></td>
<td>DirectLife uses the customer data including the advice to automate their own service, and therefore make the service more efficient and effective.</td>
</tr>
</tbody>
</table>
Peer-to-Peer  By the online service, they made it possible for users to motivate each other and share their experiences.

Revenue Sharing  Since the partnership with Weightwatchers, Philips got advantages of approaching their customer base. As a result, the (increased) profits were shared. Philips is able to obtain a share of revenue from Weightwatchers that benefits from increased value for its customer base.

Subscription  The customer pays a monthly fee in order to gain access to a the service. The customers benefit from continuous service availability and the company generates a more steady income stream.

<table>
<thead>
<tr>
<th>Table 7: Business Model Patterns DirectLife</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>4.2.4. Conclusions and key learnings DirectLife-Case</strong></td>
</tr>
</tbody>
</table>

DirectLife is a closed platform without external partners except the participating businesses, which is more a channel or an enabler than it is a partner. With this closed platform architecture, DirectLife has full control over the platform. The service component as well as the hardware component is provided by DirectLife and the user data is also fully owned by the platform owner. Due to this ‘integrated’ closed platform, DirectLife monetizes on the service component as well as on the product component of the PSS.

A disadvantage of such a closed platform where the platform owner ‘integrated’ all the platform component intern is that the platform owner takes all the investment risks. Hiring coaches, setting up a complete digital system and providing and developing the hardware requires significant investments for a single party. However, due to the high control over the platform, risks concerning misalignment in the ecosystem are relatively low.

DirectLife’s subscription based revenue model depends completely on the number of customers in the installed base. With a relatively small amount of money per month per user, the installed base has to be of a significant amount for DirectLife to become break-even. Selling directly to end-users would require high consumer marketing costs in order to reach enough potential customers. Therefore, a business channel to connect large groups of potential customers could help to realize a fast growth of the installed base. However, users have to switch to a payed subscription after the first three months free in order to stay a part of the installed base. To increase the chance that this will be the case, the reached customer segment must have significant similarities with the targeted customer segment. This was not the case at DirectLife which resulted in a major decline of the installed base after the free subscription months ended.

In the search for a new partner to sell the PSS, the main focus was to align the customer segments of both the business models of DirectLife and the business model of the potential partner. This is the major learning of the business model transformation from DirectLife to Activelink. Especially when you have to connect a lot of consumers via a business connection, then significant similarities are needed between both the customer segments of the individual business models.

In fact, Activelink has joined the platform of WeightWatchers and had to share the revenues with Weightwatchers. Therefore, the advantage of the hundred percent monetization on the PSS of DirectLife was gone. In addition, the control of managing the ‘integrated’ platform and having full control over the platform is significantly decreased when joining another platform. However, that DirectLife captured a lower percentage of the total value created since the partnership does not mean that the total value captured by DirectLife is also lower. Indeed, because the installed based grew very fast since the partnership; the total revenue increased so much that capturing 50% of the value results
in a higher total value compared to the old situation where DirectLife captured a much larger part of the total value created.

Concluding, building and investing a significant amount of resources in such a closed ‘integrated’ platform is risky when the customer segment is ‘new to the company’. In addition, such a platform is even more risky if the installed base should grow very fast in a short period of time in order to reach a break-even point.

4.3. CityTouch

Philips CityTouch is a product-service system that combines connected outdoor lights (luminaires) with additional control services. CityTouch is a dynamic and intelligent light management platform that makes it possible to optimize public lighting in terms of livability, energy efficiency and operational costs decrease. It changes static lighting into a dynamic and flexible platform with the ability to react constantly on changing situations in the city.

CityTouch started with the ‘Connected luminaire’ on the basis of the StarSense Powerline technology which is called generation one. Due to problems concerning the planning, delivery, commissioning and system maintenance, CityTouch has moved relatively fast to a new system which is called generation two. That new generation is a plug & play system which uses an existing open technology with the freed in replacing assets in any sequence. The generation two requires CityTouch-ready luminaires with a GPS technology inside, and is expected to have a better customer experience and reduces costs across the supply chain. This generation two technology makes it possible to test the system first by buying a few CityTouch-ready luminaires and the cloud software, before making the whole city CityTouch-ready.

4.3.1. Component-based Business model view CityTouch

The business model of CityTouch, including important changes and choices is described in this section. Some quotes are used to strengthen the business model explanation. See appendix III for an overview of all the quotes used to describe this business model. The ‘Key partners’ are described including the value streams of the complete business ecosystem in section 4.3.2. See Appendix V for the complete Business Model Canvas of CityTouch.

Customer Segments

CityTouch focuses on municipalities of middle size cities. This is because of two reasons, the first reason is that, when calculating over the whole world, there are more light points in middle size cities compared to the number of light points in the large size cities. The second reason has to do with the responsibility that is associated with selling to large size cities. The following quote explains the responsibility issue. “Very large cities have their own IT departments. If we have to open our system for other IT departments, then we subsequently include many other parties which will lead to a significant loss of control”

Furthermore, after three years of operating, CityTouch started to sell CityTouch-ready controllers to other luminaire makes. Therefore, these luminaire makers also became a CityTouch customer instead of a competitor. See section 4.3.2 for more in-depth arguments supporting this strategic choice.

Value Proposition

The value proposition of CityTouch consists of two major elements namely, Remote light management and asset management. The remote light management consists of the software tool that which makes the user able to control every light point and save money. The asset management element gives an accurate view of all the light points including the specifications. The CityTouch platform serves as a control point;
“You can compare CityTouch with having an app store.Creators can add apps to the store but we are the boss of the store and we determine the rules of creating value for our store”

An important choice in the value proposition is to sell the software as a service instead of selling them as software packages; “It is very important the software will be sold as a service. so not like; here is a software description and good luck with installing it, because that will go wrong in any case”

Selling the software as a service is the case since the generation two (plug & play) technology is adopted because here the software is operating from the cloud.

Channels

CityTouch has internal sales people in order to sell the value proposition to the customers. Many problems occur in explaining the value to the target customer which is due to the product-focus of the salesforce. The following quote underlines that: “In our Product-centric company, we face large problems in selling the service. All our sales teams are only trained in selling products. That’s why they react on service delivery as follows: What is a service? Service deliver? That are just costs right?"

On top of that, selling to a municipality of a semi size city provides an extra challenge for the salesforce. “In fact, we switch from our product-oriented sales teams to end-user sales teams. The product-oriented sales teams sold luminaires to installers, now we have to sell them to cities. So now, they should be able to talk with the mayor of the city and therefore need to understand how a city works and what important is. That is something completely different compared to selling 7 luminaires for example”

Next to that, due to the rapid transition from generation one to generation two, they face problems that the salespeople are not able to explain the advantages for the customer. “Our salespeople do not understand the difference between generation one and two very well. We do not have to power to explain the value to the customer”

As a result of this, competitors still sell older technology products because they have a more convincing story. “The people who bought generation two from us did not really understand how much pain they had with generation one. So in fact, we have a solution for a problem that they had, but they do not realize that themselves. In addition, the rest of the world, our competitors, is still pushing and promoting generation one technology. “

Customer Relationships

CityTouch has a long-term perspective on the customer relationships. “The customer relationships will become long-term because this way you sell 10 to 20 years of service. That is something completely different compared to product shipment and done. So what we have learned is; we sell CityTouch only in the shape of a project, so not as selling some luminaires with a software system.”

Together with the end-user, they seek for the best solutions in order to achieve the predetermined goals. In order to achieve the goals, CityTouch is willing to cooperate with the preferred suppliers of the end-user. During the usage time; CityTouch should make sure that the system will continue to operate smoothly. As already shown in the quotation, long-term contracts of at least 10 years are required to sell the complete product-service system.

Revenue Streams

The revenue of CityTouch consist of two streams; a hardware and a software revenue stream. On the hardware side, CityTouch makes money by selling CityTouch-ready Luminaires (with GPS) and by selling Outdoor Lighting Controllers (OLC) to third-party developers. Through implementing the OLC’s in the luminaires, third-party developers can make CityTouch-ready luminaires. The Business model block ‘Key Activities’ will elaborate on reasons to sell OLC’s to third-party developers.
In the first instance, the CityTouch-ready luminaire including 10 year control service was sold for a fixed amount. This had, inter alia, as a result that customers had no idea where they actually paid for. To sell this PSS, the consumer should understand that a large amount of the value comes from the service component. Therefore, customers should understand the value coming from the service component clearly, and should know how much they pay for that part. This is underlined by the following quote: “You sell the products only once, you sell the software as a service on the other hand every year. In that case you do not want that the costs will be combined in one price because than the customer does not know how much they pay for each component apart. Indeed, we sell the software as a service apart from the luminaires because only than we can sell the software with non-Philips luminaires.”

Key Resources

Next to the more ‘standard’ key resources for a product-centric company (e.g. Marketing employees, sales employees, material suppliers etc.), the data coming from the CityTouch digital platform is a key resource.

Key Activities

The key activities consists on the one hand of developing the CityTouch-ready luminaires, and making them as cheap as possible. And on the other hand of further development of the application (platform) side. Next to that, improving the marketing became a major activity since the system sales is lower than scheduled.

Another activity in order to increase the system sales is selling the Outdoor lighting controllers to third-party developers. They discovered that a most of the municipality do not want to become dependent on one party for the CityTouch-ready luminaires. This is underlined by the following two quotes: “We have to make sure that other luminaire makers, outside Philips, also want to develop and create CityTouch-ready luminaires”

“In fact that is our ecosystem of the future, that every lightcompany makes CityTouch ready luminaires. Than the CityTouch platform will be disruptive.”

Therefore, they made the control system luminaire independent which is called the OEM strategy (Original Equipment Manufacturer). Philips still has the rights to decide to which third-party developer the OLC’s will be sold.

Cost Structure

The costs of implementing the CityTouch system including the costs that have to do with the logistics are drastically decreased by the transition from generation one to generation two technology. Next to the more ‘standard’ costs for a product-centric company, Citytouch has recurring costs in order to keep the service running and up to date.

4.3.2. Transaction-based business model view Citytouch

In this section, the CityTouch platform is explained. In order to increase the distinctness of the model, only the most important partner roles and value flows are shown. The complete model with all the partners and value flows is included in Appendix VI. See figure 5 for the visualization of the CityTouch platform.

A managed service provider is included in the network as a partner. If a municipality does business with a managed service provider, than the managed service provider will take care of the complete service (including replacement) for a fixed fee per luminaire. However, many municipalities have their
own maintenance crew, and do not want to depend on a managed service provider. In that case, the CityTouch platform is useful for municipalities to stay in control of their light park.

Next to that, the CityTouch platform could also be useful for a managed service provider to increase the efficiency of their service. Therefore, a managed service provider is not evaluated as ‘just’ a competitor, but more as a partner or a customer. As a customer because of the reason that they can buy the CityTouch platform, and as a partner because CityTouch can work together with managed service provider to create the best offering for the end-user (the municipalities). The following quote underlines this vision of CityTouch as a platform: “We have to be a platform ecosystem together. Because eventually, and that is what we see in all industries; the ecosystems are winning, not just companies. So it is not Apple who is winning, but is the Apple platform ecosystem that is winning.”

The reason to work together with luminaire competitors, managed service providers and installers is to increase the installed base of Citytouch-ready luminaires worldwide. “In fact, the market still has to start. When we look at the installed base of luminaires in the world, then there are approximately 250 to 300 million light points. From all that lights, approximately 1 to 1,5% is ‘connected’. So a large part of the rest has to get connected sometime in the future.”

Close cooperation with the ecosystem partners increase the overall awareness of the PSS. If other partners also benefit from a growth of the installed base, than they could also have a conscious or even unconscious sales role. An example of this statement is given in the following quote: “You have installers for example. If an installer for instance already has a contract with a municipality, than it is handy to start working together with that particular installer. However, if you for example make an offer for a city, than it is nice if the installers say that your products are good stuff.”

![Figure 5: Platform Ecosystem CityTouch](image-url)
4.3.3. Business Model Patterns Citytouch

The following patterns are identified in the business model of CityTouch. See Appendix IV for a short general description of the patterns according to the St. Gallen Business Model Navigator.

<table>
<thead>
<tr>
<th>Business Model pattern</th>
<th>Explanation (CityTouch)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Add-On</td>
<td>The CityTouch platform is designed to add-on other services like; particulate measurement, traffic management and other future innovations.</td>
</tr>
<tr>
<td>Digitization</td>
<td>The Citytouch platform provides many advantages due to digitization of services. For example, it is easy to see for users which luminaires need to be replaced etc.</td>
</tr>
<tr>
<td>Flat Rate</td>
<td>A fixed amount per luminaire per year has to be paid for the use of the platform. The user can use the services without usage or time restrictions on it.</td>
</tr>
<tr>
<td>Leverage customer Data</td>
<td>Product and service improvements are made by collecting customer data and preparing it in beneficial ways for internal usage.</td>
</tr>
<tr>
<td>Lock-In</td>
<td>The customers are locked into a vendor or products and services. When they have bought the Citytouch platform, they are locked-in to CityTouch-ready luminaires working on that particular platform.</td>
</tr>
<tr>
<td>Mass Customization</td>
<td>The Citytouch service platform including the Citytouch-ready luminaires enable efficient individualization of the system for users. Through this, individual customer needs can be met within mass production circumstances.</td>
</tr>
<tr>
<td>Open Business Model</td>
<td>Citytouch collaborates with partners in the ecosystem to search for novel ways of working together with suppliers and customers to open and extend their business</td>
</tr>
<tr>
<td>Open Source</td>
<td>Citytouch is going to sell OLC’s to third party developers. Through this, third party developers are able to make the same type of luminaires working on the Citytouch platform.</td>
</tr>
<tr>
<td>Revenue Sharing</td>
<td>Third-party developers are able to obtain a share of revenue of the CityTouch-ready luminaires. Thereby, Citytouch benefits from the increased value for its customer base by selling more of the CT service component.</td>
</tr>
<tr>
<td>Subscription</td>
<td>CityTouch enters into a contract with customers, defining the length of the service provision. The customers pay for the service on an annual basis</td>
</tr>
<tr>
<td>Two-sided market</td>
<td>Two-sided markets facilitate interaction between two complementary groups for mutual benefits via a platform. In this case, the CityTouch platform facilitates interaction of third-party CityTouch-ready luminaire makers and potential customers.</td>
</tr>
</tbody>
</table>

Table 8: Business Model Patterns CityTouch

4.3.4. Conclusions and key learnings CityTouch-case

CityTouch is a ‘partly’ open platform product-service system with CityTouch-ready luminaires as hardware component and a cloud based control software as service component. The software is sold as a service (Saas) on a cloud basis which makes it easy to update and results in recurring revenues. Municipalities and businesses did not want to be fully dependent on one party as hardware provider. Therefore, CityTouch was ‘forced’ to open the hardware side of the platform, and inviting third-party developers to develop CityTouch-ready luminaires.
The main reason for the reluctance of the customers to adopt the platform is the lock-in effect of buying the product-service system. Once it is decided to invest in CityTouch-ready luminaires, the switching costs to go back to the previous luminaires are very high. Since the CityTouch platform is not usable in combination with non-CityTouch-ready luminaires, the technology can be considered as disruptive when CityTouch becomes successful. Companies introducing such a platform containing a disruptive technology should decide more quickly to attract third-party developers to the platform. CityTouch realized that, only by opening the product component of the platform, CityTouch could become the platform of choice.

Another choice CityTouch made in becoming the platform of choice is to keep the software as a service open for possible new services. It is important to remain the most complete platform in order to stay (or become) the platform market leader. In addition, it is also important not to exclude third-party developers for making complementary services for CityTouch. For example, third-party developers can have more resources and capabilities to create new services for the platform. Opening the platform for future services gives potential to grow, and remain the platform as the platform of choice through add-on business model opportunities.

When selling OLC’s to third-parties, CityTouch can decide about which parties to enable producing CityTouch-ready luminaires. However, in reality, especially in the beginning when the platform is not (yet) dominant, it will be a challenge to convince third-parties to produce CityTouch-ready luminaires. Such a third-party developer has to make significant investments in preparing the business in order to be able to develop CityTouch-ready luminaires. For their return on investments, they are completely dependent on CityTouch, and on how successful the platform will become. Therefore, convincing third-party developers to create CityTouch-ready luminaires will be more likely the case than having the luxury position to select companies to develop such luminaires.

Next to that, especially for a product-centric firm such as Philips, selling such a product-service system with the service component as most important source of monetization gives extra complexity. Businesses tend to think that they buy a product, and the service is something ‘extra’ to the product. With this consideration, businesses do not see and understand that a major part of the value of the platform is in the service component. An effective solution to avoid this is to set a price for the product component, and a price for the service component separately. When asking a total price for the product-service system, customers have no idea where they really pay for. In the case of CityTouch, this leads to the assumption of customers that they only pay for the product.

Finally, to sell such a large and customized product-service system; the distribution channels (salesforce) and the customer relationships should be improved drastically compared to the traditional product-centric business models. A salesforce that is trained in selling products lacks competence in selling a product-service system. On top of that, selling to a public party requires specific skills and experience. A strategy to obtain a long-term customer relationship is to sell the system as a project instead of selling it just as a product-service combination. Simple starters packages with a few luminaires and the software makes it possible to try the system and lowers the barrier to invest in the system on a larger scale.

Finally, using the data of earlier projects can increase the advice component of the service and therefore the quality of the service.
4.4. Medido

Medido is a smart medication management service for elderly people and patients who face complexity in taking their medication the right way on the right time. Normally they receive help from their environment and/or home care institutes. Medido works with a fully automatic dispensing system, drug rolls and a special e-health platform. It makes sure that patients receive the right medication at the right time. Therefore, the solution decreases the probability of incorrectly taking the medication. In addition, it supports the home care institutes because they have more time for other important caring.

4.4.1. Component-based business model view Medido

The business model of Medido, including important changes and choices is described in this section. Some quotes are used to strengthen the business model explanation. See appendix III for an overview of all the quotes used to describe this business model. The ‘Key partners’ are described including the value streams of the complete business ecosystem in section 4.3.2. See Appendix V for the complete Business Model Canvas of Medido.

Customer Segments

Philips focuses on the business segment by selling the system to home care institutes instead of selling it to the patients directly. This choice is made because home care institutes were easily able to identify how many patients were eligible for the device. The following quote confirms that. “We wanted to push the Medido in large numbers to the customer in order to increase the revenues as soon as possible”.

Value Proposition

A product-service system platform that helps on the one hand patients to take the right medication at the right time. And on the other hand, the home care institutes to save money because homecare workers do not have to visit patients less often. In addition, “Philips delivers all the information material needed for a successful implementation of the product-service system”.

Channels

The Medido is sold through salespeople who have affinity with healthcare. Thus, Philips uses a B2B sales strategy in which they approach home care institutes. These negotiations took place at a management level which has an advantage that this way, they were able to sell many devices at the same time. In addition, to reach a required level of efficiency, it was needed to serve as much patients of a single care institute as possible. This is because major investments must be made in the IT infrastructure, and in education for nurses to make them able to deal with the device. “When there is a deal at the management level, then the PSS still has to be promoted in the workspace. This is very important because the nurses have to decide which patients are eligible for the Medido”. However, the problem for Medido is to convince the nurses about the solution. Ultimately, they decided how many Medido systems will be installed at patients homes. The transaction-based business model view of Medido will elaborate on this challenge.

Customer Relationships

Medido maintains a long-term relationship with the home care institutes. “We have contact with a manager of a home care institute. Therefore, we look together with the manager to the information of the patients i.e. their healthcare needs, the additional treatment they need etcetera”. “Together we
do this periodically and decide for which patients the Medido is a useful solution”. As the quotes above describe, the customer relationships take place on management level on a periodic basis.

Revenue Streams

The Medido devices are leased to the home care institutes for a fixed fee per month. “For each device, a fixed amount per month can be declared at the health insurance company. With this amount of money, all the partners have to be paid”. In addition, “of course we have thought of other revenue models, but that is of little use when you are completely dependent on a fixed amount defined by the health insurance.”. Since there are many partners in the business ecosystem, the value capturing per partner is relatively low. Section 4.4.2. will elaborate on this.

Key Resources

Next to the more ‘standard’ key resources for a product-centric company (e.g. Marketing employees, sales employees, material suppliers etc.), the data coming from the Medido digital platform is a key resource.

Key Activities

Since Philips is the platform leader, managing the platform became the most important key activity. As will be discussed in section 4.4.2, Philips uses many partners in order to provide and implement the PSS at home care institutes. In addition, B2B marketing is an important activity. This marketing focuses on ‘selling’ the PSS to other, not yet equipped, home care institutes. When a home care institute eventually adopts the solution, a number of activities have to be performed. For example, the devices have to be made connected with the alarm centers of the home care institutes, and the installation partners must be informed about at which homes the device has to be installed. Furthermore, the data is used to improve the product service system. “We use the data to improve the product-service combination. For example, in the beginning we had some problems with false alarms, this was because the laser of the system which should read the etiquettes did not work properly. We deduce this kind of problems from the data and improve the PSS with it”

Cost Structure

The costs have mainly to do with the management of the platform, and paying the partners for their part of the value creation. The costs consists of B2B marketers, distribution costs, leasing costs of the devices and IT system related costs. In addition, the extra costs for the pharmacists are made because the medication must be placed in special roles.

4.4.2. Transaction-based business model view Medido

The platform of Medido is visualized in figure 6. All the partners in the square belong to the home care institutes. Each institute has its own alarm center and their own care providers (nurses). The Financier, in this case, is a company that has all the responsibility for the quality and the delivery of the Medido devices. In addition, the devices stay on the balance sheet of that company. Therefore, Philips rents the devices from that company and then leases the devices to the home care institutes. Because Philips has not much knowledge and experience in this business field, they use a advisory partners which helps Philips to assist the home care institutes with implementing the solution. They provide help with the processing of the sales orders and with the IT connection to make sure that a device is connected to the right alarm center of the right home care institute. The device gets installed by an installation partner specialized in installing medical home devices. Another key partner which is disregarded in this model, is the pharmacist who has to deliver the medication the specific rolls that can be placed in the Medido device by the nurses.
The sales performance of the business model was significantly lower than expected. Therefore, external business professionals were hired in order to find the major obstacles in the business model.

The first issue of this model is that the sales are performed on management level, but the nurses eventually have to decide together with the patients about taking the solution or not. In fact, in order to increase the system sales, the nurses must be convinced about the solution. However, Philips focused on the management level in order to increase the installed base of connected home care institutes. What eventually happened is that the nurses were cynical about the devices because they were not correctly informed about the potential benefits for them. In contrast to that potential benefits, they only saw obstacles in the use of the Medido. “The nurses were not sufficiently involved in the implementation of the Medido. Therefore, we now focus on giving them a more central role in the decision making process”.

“In fact, the nurses are our potential ambassadors and we invested too little in involving them on this innovation”. In order to make them convinced about the solution the Medido PSS can provide, Philips should also focus on the advantages of them instead of the advantages for the home care institutions. “We have underestimated the fact that many patients have more care services in their arrangement. For them, the Medido solution is less effective because the nurses still have to go to their homes”.

Another issue is that this platform consists of a lot of partners who all have to capture a sufficient value in order to keep creating value on the platform. The revenue model completely depends on the monthly leasing fee per installed Medido. This also explains why there is a strong focus on increasing the installed base in order to become a profitable platform. Philips receives a ‘renting’ fee from the home care institutes per Medido. And from that money, Philips has to pay its advisory partner, the financier, the installer and also cover its own costs. “Philips rents the Medido devices from another party. This is a strange construction but it is needed because Philips does not give permission to put the
devices on its balance sheets without selling them. Therefore, this is the only construction which makes it possible for us to use a leasing revenue model.”

In addition, in order to lower the installation costs and increasing the number of satisfied customer, a major focus is to make the Medido more plug and play. “At this moment, the lead time is way too high. The installation at the patients homes, and also the installation of the IT facilities bring many problems that lead to unsatisfied customers”. At the moment, the number of partners is high which is negative for Philips’ value captured. But on the other hand, they share the investment risks now with many other parties. “We only start thinking about integrating more activities when the volume of systems sold is big enough”. In addition, “In the future we want to share the revenues on the basis of performance-based contracting in order to share our risks better with our partners”.

### 4.4.3. Business Model Patterns Medido

<table>
<thead>
<tr>
<th>Business Model pattern</th>
<th>Explanation (Medido)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Digitization</td>
<td>The medication use of patients is digitized in data forms.</td>
</tr>
<tr>
<td>Flat Rate</td>
<td>A single fee for the product-service system is charged per month. The user benefits from a simple costs structure while the company benefits from a constant revenue stream.</td>
</tr>
<tr>
<td>Leverage Customer Data</td>
<td>New value is created by collecting customer data and preparing it in beneficial ways for internal usage and in the future possibly for interested third-parties.</td>
</tr>
<tr>
<td>Mass Customization</td>
<td>Individual customer needs can be met (e.g. the right medication, the right amount provided at the right time) by the same product functioning in the same ecosystem.</td>
</tr>
<tr>
<td>Open Business Model</td>
<td>Philips Medido works together with several partners in order to allow the system to work properly.</td>
</tr>
<tr>
<td>Rent Instead of Buy</td>
<td>The Medido is leased instead of sold. Philips is paid for the duration of the rental period. This makes higher efficiency in product utilization possible.</td>
</tr>
<tr>
<td>Revenue Sharing</td>
<td>The revenue resulting from the product leasing is shared by Philips with all the stakeholders of the business ecosystem.</td>
</tr>
</tbody>
</table>

Table 9: Business Model Patterns Medido

### 4.4.4. Conclusions and key learnings Medido-case

The Medido is a closed platform with many partners involved in order to provide and manage the product-service system. An advantage of performing a PSS in such an ecosystem architecture, is that a lot of knowledge comes together and can be shared between the partners. In this case, Philips did not have the required knowledge and capabilities to implement such a PSS in such an healthcare environment. Therefore, external partners were needed in order to develop and implement the Medido system. Another advantage is that investments risks can be shared among the partners of the ecosystem. All the partners have to invest in such a platform in order to create sufficient value on the platform. For example, the installation company has to invest in order to learn employees to install the Medido properly. If the employees would not be able to install the devices, then they cannot add value to the platform.

A disadvantage of such an ecosystem is the revenue sharing capabilities i.e. who captures how much of the value created. This case shows that, as a platform leader, you capture the value that is left after all the other parties have captured their share. For example, the advisory partner captures value based on the number of hours worked on the project and the installing company captures value on the basis of the number of devices installed. Since this is a healthcare product, there is dependency on the height
of the monthly fee provided by the health insurance companies. A possible alternative could be to make performance agreements with the partners on the basis of performance-based contracting. This way, the value captured by the ecosystem partners depends completely on the performance of the business i.e. on how many systems are leased.

Furthermore, selling a product-service system business to business has its advantages and disadvantages. A major advantage why Medido used this sales strategy, is to reach many potential end-users at once. In case of when a home care institute adopted the Medido solution, nurses can identify which patients are eligible for such a solution, and then Philips can lease many devices at once. In fact, such an approach is also needed because it is not profitable to connect each device separately to an alarm center of a home care institute. However, in order to make this sales channel strategy successful, you should approach the end-user either in order to make him or her enthusiastic about the advantages of the system. Here, you must be able to explain the value of a product-service system for an end user, which is completely different compared to explaining the value of just a product. Therefore, such a B2B approach will only work if you are able to explain the value to the end-user which are the nurses in this case.

This case also learned that a product-service system should be plug and play first, before many other home care institutes will be connected. In the beginning, this product was not industrialized enough which resulted in problems and product failures. In addition, the installation of the complete system took more time than expected in the beginning. A result is this, is that he end-users, the nurses in this case, are unsatisfied about the solution. Furthermore, when the integral installation takes way more time than expected, even the managers will become unsatisfied. Therefore, first make sure the PSS is plug and play before enrolling the solution on a large scale. In this case, plug and play means that the product must be industrialized and work properly, and the installation time must be able to stay within the planning.

Finally, it is the question of such a closed platform solution is sustainable on the long-run. Because there are also other product-service systems in this market which is for example solutions where patients can receive care at home with tv screens and webcams. All these product-service systems require their own ecosystem and infrastructure. So to increase efficiency, an open platform which can connect all these PSS in this field would be a plausible future innovation. In that case, the nurses will use one application instead of a single application for each PSS. Therefore, it is plausible that all such closed platform will connect to an open platform to increase efficiency. The question is, which party will invest in such an open platform structure?
5. Results Cross-case analysis

In this section, the case-studies, individually described in chapter four, will be compared in order to answer the main research question. The main focus is on the differences between open versus closed platform business models. In section 5.1, patterns characterizing all the PSS business models of the case study will be discussed. Thereafter, in section 5.2, the differences concerning open versus closed business models will be explained and new theoretical models will be proposed.

In this cross-case analysis, the major purposes of the business model, namely value creation and value capturing defined by Dorf et al. (2010) will be evaluated for the business model patterns. It must be clear that without creating value, there is no value to appropriate. “The pie must first be created, before it can be divided into pieces” (Jacobides, 2013). In general, the shift from traditional product-centric to more platform oriented business models was, and still is, an enormous challenge in all the cases. The traditional business models were more like pipes, products were created and ‘pushed’ to the customers. In general, this was a linear flow where cooperation with partners in an ecosystem was not an issue. The case-studies evaluated in this report are more platform oriented business models and therefore do not ‘just’ create products and push them on the market. They created a platform consisting of a product-service system wherein they create value together with partners. Depending on the case, these partners can be customers, (former) competitors or third-party developers (see the business ecosystems of the case studies in chapter four).

These platform oriented business models differ significantly from the traditional product-centric business models. Even more confirmed by the following interview quote: “If you go about building a platform the way you would build a pipe, you are probably setting yourself up for a failure”. In order to create a successful product-service system platform, all the cases had to make a shift from product-centric to a more customer-centric orientation. In addition, where traditionally the product sales were the most important performance measure, now the installed user base of the platform will become of major importance in order to stay or become the platform of choice. On top of that, next to the challenge concerning revenue models, there is another challenge about revenue sharing with the platform partners. Namely, all the platform actors have to capture enough value in order to survive and keep creating value on the platform.

5.1. Results Business Model Pattern Analysis

The business model pattern analysis gives a clear picture of the differences and similarities in business model elements of product-service systems at Philips (see table 10). As can be seen in the table, some business model patterns appear in all the four cases, and some of them appear only in a few of them. In this section, the patterns that appear in all the business models will be explained and compared across the cases. Section 5.2 will discuss the differences between the cases.
Digitization is a business model pattern that is reflected in all the case-studies. It consists of transforming an existing product or service into a digital variant, thus providing advantages such as the elimination of intermediaries, reduced overheads and more streamlined distribution. For these cases, digitization provides new opportunities for the businesses by using the internet. For example, the service elements of Hue and DirectLife consist of many digital components by using applications working on the internet. Hue developed a digital way to control the in-house lighting and DirectLife uses a digital platform for coaching clients. Especially in the business to consumer setting which is the case for Hue and DirectLife, digitization has been a solution for interactive communication over the platform between customers. Here the customers can share experiences (Hue) or motivate each other (DirectLife). In fact, digitization enables peer to peer communication which is also a business model pattern. This peer to peer (community) function is evaluated as an important element of the customer relationships. In both the cases, Hue and DirectLife, the businesses participate in these communities in order to acquire valuable information for product and or service development. In the future, a choice could be to monetize on this pattern, for example by generating revenue through advertising.

In addition, CityTouch created a digital online platform to control the outdoor lighting for a city, and Medido replaced physical medication-intake care by a product and a digital service. In-house IT departments are used to provide the digital component of the PSS, which is an enabler in all the ecosystems. Next to that, these IT departments collect valuable user data. In order to keep the digital components of the value proposition running, continuous investments and activities are needed. In addition, partnerships with web and or cloud providers are needed in all the case-studies to enable the business to deliver the digital proposition.
Since digitization is an emerging pattern in all the PSS cases, it can be seen as an important pattern of value creation. Through digitization (e.g. IT networks), the cases are able to connect the service and the product component of the PSS. Indeed, in the cases of Hue and CityTouch, the whole service component is digital. Therefore, digitization creates value within the business model platform.

5.1.2. Leverage Customer Data
All of the product-service systems acquire a lot of data due to the digital elements in the system (online platforms etc.). Another reason is that Philips comes much closer to the customer through the product-service systems. A business model for a product-service system is much more customer-centric compared to a traditional product-centric business model. Because of that, a product-service system acquires a lot of user data. All the interview respondents showed awareness about this aspect, and also about the possible high values of the data considering product/service innovation and economic aspects. However, the level of awareness and practical implications of the data differs per case-study. DirectLife, for example, was from the beginning aware of the data coming from the user behavior in combination with the advice of the coaches. That was one of the major reasons to hire the coaches, and thereby the service component, ‘in-house’. The continuous growth of data was needed to make the coaching service more efficient and digital. They knew from the beginning that it would be too expensive to coach each client personally. Next to the use of data for product/service development, the data could also be used to develop new innovative propositions for the preventive healthcare industry.

On the other hand, CityTouch acquires a lot of user data via the cloud based controlling system. In addition to using this data for improvements of the value proposition, the data can lead to more concrete advice and sales possibilities for other (not yet equipped) semi size cities. However, in order to do so, the prominent patterns and trends have to be detected in the data. A business developer of CityTouch called Philips; “As green as grass” on the aspect of finding the ‘most’ valuable patterns in a large dataset.

In addition, in all cases the question arises to which extent the data can be used for economic purposes considering user privacy regulations. Due to these uncertainties, Hue uses the user data only for hardware and software innovation of the Hue system. However, they know that the user data can be analyzed from different perspective and a possible source for other (hidden) economic value. That strategy is also used in the case of Medido.

Using customer data in order to improve products and/or services leads to more satisfied customers and therefore to new value creation. In addition, transforming data into new services, for example, the advisory service of CityTouch, is also a way of creating new value from data. Thus leveraging customer data leads to value creation.

5.1.3. Mass Customization
As already mentioned in section 5.1.2, a product-service system brings a company closer to the customer. That contains a transformation in the case of Philips from product-centric to customer-centric. Especially due to the service component, the company comes closer to the customer and stays ‘connected’ with the customer. All the case-studies showed that a product-service system is able to customize the combination to the customers’ needs while simultaneously keeping efficiency (almost) as high as in traditional mass production. This can be realized through the combination of different product and service modules (at least one service and one product module). In addition, the service component, which can be evaluated as one or more modules, is a means of differentiation themselves from mass-producing competitors. This is also, what emerged from the case-studies, leading to a closer relationship with the customers and becoming more customer-centric. For example, in case of the Hue,
a customer can expand its Hue system with his or her preferred product, and can choose the app he or she prefers. This provides the customers a wide variety to fit their individual tastes. The benefit for customers is to buy bespoke products without having to pay significantly more for them.

In the cases DirectLife and Medido, mass customization is achieved by the service component of the PSS. Here, the service component is provided by humans supported by the digital network. DirectLife has human coaches that are able to provide customized advice with the help of the dataset and their professional expertise. In addition, the service enables mass customization for Medido by customized treatment fulfilling specific patient needs concerning drug supply.

Moreover, CityTouch achieves mass customization by selling the product-service system only in the form of a project with intense counseling. That is a completely different approach compared to the traditional product-centric approach where the products and services are sold without further (strategic) assistance.

Concluding, with mass customization, a customer can combine different components/modules of a product-service system to realize the highest value. Therefore, mass customization creates value for customers individually. Through mass customization, all the cases are able to maximize the value for the customer, and therefore, create a higher platform value.

5.1.4. Revenue sharing

Due to the reason that all the four case-studies are developed within an ecosystem, there is revenue sharing between the different actors in the ecosystem. In most of the ecosystems, these are partners co-creating the value proposition, or partners who add complementary products or services to the platform. In general, all the ecosystem partners in the cases work together to achieve a common goal and share in the profits made. In all the cases, the partnerships were made to deliver the product-service system, to enlarge the customer base and to strengthen competitiveness. In addition, with the cooperation of different partners in an ecosystem, risks concerning investments were shared and forces were combined. However, the revenue flows between the partners in the different ecosystem differ significantly of each other. The most important reason for this difference is the focus on platform growth. For example, providing competitive rules for partners to connect to the ecosystem will lower the barrier for those partners to connect. Therefore, the platform will grow faster and the chance to stay, or become the platform of choice in that particular market segment will increase.

Hue focuses on platform growth and in order to achieve that, the costs for partners to connect to the Hue platform are very low or even zero. App creators for example are allowed to make apps for the Hue system without sharing revenues with Philips Hue. Thereby, they can ask a fee for every time the application is downloaded, and do not have to share a part with Philips. The strategy behind this, is to make sure that app creators will refrain from creating apps for the Hue due to financial reasons. Therefore, the significant costs Hue has to make to allow others to create app for the Hue system are an investment in the growth of the platform. In addition, this is also the case for complementary hardware products to enlarge the hardware side of the platform, and therefore to expand the Hue system opportunities for users. A similar situation exists in the ecosystem of CityTouch where they try to sell outdoor lighting controllers to third-party developers for a ‘very low’ price. By means of that, CityTouch tries to convince third-party developers to develop CityTouch-ready luminaires. However, these situations of revenue sharing can change completely when CityTouch and Hue become powerful platforms. In that case they can ask fees for joining the platform instead of investing in it.

Another style of revenue sharing is visible in the ecosystems of DirectLife and Medido. In the case of DirectLife, revenue sharing was not a relevant pattern until the partnership with Weightwatchers
under the new name: ActiveLink. Since ActiveLink became a product-service proposition on the WeightWatchers platform, they used a 50/50 revenue split concerning the revenues of ActiveLink. Medido on the other hand emerged out of an initiative of many partners in an ecosystem. All the partners received a revenue share from the total monthly revenue generated per installed Medido device.

Since an ecosystem creates value, revenue sharing is an important aspect to keep all the actors of the ecosystem satisfied. Every actor in the ecosystem has to capture a properly part of the value in order to continue to participate in the ecosystem. However, the total sum of revenue generated can still be bigger in case of revenue sharing compared to no revenue sharing (i.e. no partnerships). For example, since the partnership with WeightWatchers, DirectLife captured only 50 percent of the value created because the other 50 percent was for WeightWatchers. Actually, since the partnership with WeightWatchers the value created duplicated making DirectLife capturing more value than before the partnership. In case of Hue and CityTouch there is matter of cede value to partners in order to increase the installed base of the platform. Section 5.2. will elaborate on this discussion.

To sum up, roughly two platform related choices can be distinguished concerning revenue sharing, namely open platforms and closed platforms. Section 5.2 will elaborate more on these platform related choices in the ecosystem of the product-service systems at Philips.

5.1.5. Customer Loyalty
As mentioned already before, product-service systems bring Philips much closer to the customer. When providing a service, a customer will stay more connected compared to just delivering a product. Developing a relationship with the customer is important to keep the customers connected to the platform. In all cases, the idea behind a high customer loyalty is that; customers are voluntarily bound to the company, which discourages them from opting for competitors’ platforms and thus protects the company’s revenue. This pattern has also a similarity with increasing the installed user base of the platforms. Section 5.2.1. will elaborate on that aspect and purpose of customer loyalty. However, in all the cases, searching for an effective customer loyalty form is a challenge. The traditional Philips ‘pipeline’ business models are cited as the biggest issue in building customer loyalty. Such product-centric business models have led to a minimalistic resources and capabilities concerning the customer relationship building block. For example, the Philips customer care services is fully focused on product-related questions and is unable to handle questions/problems about the service component.

There are major differences in the way the four cases achieved, or tried to achieve, customer loyalty. Hue for example, makes users aware of new product and features by sending emails to them. Existing customers often receive inexpensive offers to expand their system. DirectLife on the other hand offered the first three months free subscription in order to bond customers to the company. CityTouch and Medido offer comprehensive service to support the purchase of systems and to support the integration. A clear distinction can be made concerning whether the customer segment of the business model is a consumer or a business. In section 5.2. this distinction including its implications will be deepened.

In all the cases, there is awareness about the importance of customer loyalty in order to create value. Thereby, customer loyalty serves as an important pattern to prevent customers from going to another service or PSS provider. Since the traditional product-centric business models of Philips is underdeveloped in terms of long-term customer relationships, improving customer loyalty is a major point of attention. The direct relation to customer loyalty and value creation did not came directly from the interview data. However, Vargo & Lusch (2004 and 2008) confirmed this positive significant relationship in their research.
5.2. Open versus closed Platforms

As indicated in the methodology section, the cases were selected to compare them on the ‘openness’ of their platform. A closed platform does not require continuous integration of new third parties. In that case, the business ecosystem will consist of a selected number of firms. As indicated in figure 7, CityTouch and Hue are PSS platforms with an open source component, and Medido and DirectLife operate in a closed PSS platform.

Another major difference is in the platform architecture of the four cases. Namely, Medido and CityTouch sell and deliver the PSS to an organization (PSS to organization). Medido sells to home care institutes, and CityTouch to municipalities, managing service providers and to other luminaire makers. On the other hand, Hue and DirectLife deliver the PSS directly to customers (PSS to customer). In the case of DirectLife, there is some doubt because it uses a business as sales channel in order to sell the solution. But apart from that, the solution is sold directly to the consumers and the consumers have to pay a subscription fee. Therefore it can be evaluated as a PSS to consumer business. In addition, since the partnership with weightwatchers, DirectLife made a switch from ‘PSS to consumer’ to ‘PSS to organization’ because it delivered the solution in large quantities to WeightWatchers. Therefore, in this matrix, DirectLife is used before the partnership with WeightWatchers.

However, PSS to organization or PSS to consumer implies a lot of business model related differences. For example the channels, the whole marketing activities and the customer relationships require a completely different approach. Therefore it is interesting to compare open versus closed source with PSS to organization versus PSS to customer (See figure 7).

5.2.1. A PSS Platform Framework

As a starting point of this platform type analysis, the PSS platform ecosystems of analyzed case-studies were compared in order to develop a PSS platform framework (see figure 8). This PSS framework is created in order to create an overview of the different choices in creating a PSS platform. In all the PSS platforms, roughly four main type of actors can be defined. Namely, a service developer, the PSS platform provider (leader), an (additional) device producer and the customer. In some of the platforms, the customers can exchange experience with each other in the so called ‘user community’. The other three actors/roles can be provided by one company, or by more companies. For example, in the case of DirectLife, the service provider, hardware provider and platform provider are all integrated in one company. In the other cases, there is a minimum of at least two parties providing the PSS. In all cases Philips is the PSS platform leader and provider. In addition, external service and/or product developers can sell their content directly to the platform user, or via the platform provider. In that last case, the product-service system is sold completely through the platform provider.

The framework distinguishes an open versus a closed platform through the ‘providing license’ value flows. A closed platform does not require continuous integration of new parties. The collaboration is limited to a selected number of firms (Smedlund, 2015). So in case of a closed platform, the PSS
provider provides licenses to a selected number of firms to develop content for the PSS platform. In case of an open platform on the other hand, content developers can directly enter the platform and do not need a license. So in that case, the platform permits continuous integration of new partners on the platform. However, it must be clarified that open and closed platforms are not that black and white; there are also ‘partly’ open or closed platform designs possible (West, 2003).

In contrast to DirectLife, the other cases facilitate interaction between two complementary groups for mutual benefit via the platform (two-sided market). For example the Hue platform facilitates interaction between app creators and the Hue customers, and the CityTouch platform facilitates interaction between competitive CityTouch-ready luminaire makers and municipalities. In the PSS platform framework, this is visualized in the PSS platform producers square. Here the content/service developer and/or complementary device producers can sell directly to platform customers.

Figure 8: PSS platform framework defined by this multiple case-study research

### 5.2.2. Installed base

A major issue of focus in each of the four cases is the growth of the installed base. In order to become a profitable platform and/or a platform of choice, the installed base most grow to a significant height compared to competitor platforms. The achievements of targets in general is not new for a product-centric company, but targets concerning the installed base require different approaches compared to targets concerning just (pure) product sales. In case of pure product sales, the focus is to sell the product where customer relationship traditionally is a less important factor. However, in case of selling a service, customers should ‘stay’ in the installed base in order to remain the service revenues which is normally paid on a periodic basis. Thereby, investing resources in customer relationships is more important in order to keep the users in the installed base.

The dependence of the growth is different for each of the four cases. Hue is the only case that does not depend on service revenue. In that case, revenue is only made by sales of Hue systems and Hue products that extent the system. CityTouch is more dependent on the size of the installed base because, the bigger the installed base, the more recurring revenue from the service component. On top of that, Medido and DirectLife are fully dependent on the installed base. Medido uses a rent instead of buy system where they only receive revenue when they rent systems. DirectLife has
integrated the service component completely ‘in-house’ which makes their monthly recurring service costs very high. In order to reach the break-even point (total service costs per month/single subscription income per user), a high minimum number of users is needed.

Different strategies and channels are used in order to increase the installed base. As showed in table 11. Hue en CityTouch decided to partly open the platform for third-party developers in order to increase the installed base.

<table>
<thead>
<tr>
<th>Case</th>
<th>Strategy to increase installed base</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hue</td>
<td>Partly open platform in order to reach a self-sustaining growth cycle</td>
</tr>
<tr>
<td>DirectLife</td>
<td>Selling to consumer via a business channel</td>
</tr>
<tr>
<td>CityTouch</td>
<td>Partly open platform in order to reach a self-sustaining growth cycle</td>
</tr>
<tr>
<td>Medido</td>
<td>Selling to business instead of selling to end-user directly</td>
</tr>
</tbody>
</table>

Table 11: Different strategies to increase installed base

Hue and CityTouch are maybe less dependent on the installed base concerning the revenue streams, but the viability of their platforms is very dependent on the size of the installed base. As the market share of platforms grows, so also grows the barrier to entry for competitive platforms.

5.2.3. Open Platforms

There are major differences in the way CityTouch and Hue design their (partly) open platform ecosystem which is mainly due to the difference in direct customer (PSS to organization versus PSS to consumer). As mentioned in chapter two, a product-service system consists roughly of a product and a service component (which could be pure digital). The company can monetize on one or both of the two components, namely, on the one hand by selling the hardware, that is a single revenue stream. And on the other hand by selling the service which is mostly a recurring revenue stream on a periodic basis.

When evaluating an open platform ecosystem strategy for PSS, there are roughly three options; namely to open one of the two components, and keep the other closed. Or to open both components. In that last situation, the platform can grow very fast, but the question is on which block to capture enough value in order to become profitable. These options are summarized in the model of figure 9 where at least one of the two blocks must be opened to name it an open platform.

![Figure 9: A PSS open source platform framework](image)

Hue sells via regular distribution channels to residential customers. They keep the product component closed because they want to sell their own products, and monetize on that component. Therefore, Hue captures only a part of the value coming from the product component of the PSS. It does not capture any value of the service component, which is created and made operationally working by Hue. The service component of the platform is open source for third-party developers. CityTouch is doing the opposite by opening the product component of the platform and closing the service component. Therefore, CityTouch captures all the value coming from the service component of the PSS. In addition, it captures less value on the product component since others can create CityTouch-ready luminaires.
The business developers of the Hue found out through market research that most of the customers did not want to pay for pure digital value/service. Thereby, opening the product component for third-party developers to make Hue hardware would be a high risk concerning the revenues. Only a few of the Hue customers would be willing to pay for the digital service which would lead to a stagnation of the platform growth. Therefore, the product component was closed, and the service component was open for third-party developers. In order to increase the revenue, Hue regularly launches new upgrades to increase the total components and possibilities of the Hue system. They also invests in connecting with hardware of third-party developers in order to stay the platform of choice, and to increase the number of possibilities for the software (application) developers of the Hue. Eventually this should lead to an increase of the installed base, and therefore, to an increase of system sales.

The business developers of CityTouch were quasi forced by the market to open the product component of the platform, and to allow competitors to make CityTouch-ready luminaires. In order to monetize on the platform, CityTouch kept the service component closed. The main reason for this, is that businesses do not want to be dependent on a single hardware provider. Because of this reason, PSS to organization versus PSS to consumer could lead to a major difference in setting an open platform strategy.

In addition to the above described major differences between Hue and CityTouch, there are some similarities. Both Hue and CityTouch have patterns of Lock-in and Add-on in their business model. In case of Hue, customers are ‘locked-in’ to a vendor’s world of products and services in such a way that changing to another provider would incur substantial costs and effort. In terms of switching costs, a complete new wireless home light controlling system of a competitor should be bought. In addition, there is effort needed to change the system physically, and effort in order to get used to it. New apps should be installed, and customers should learn how to create the desired effects with it. Furthermore, new software and hardware upgrades create a so called add-on effect on the business model. These upgrades can drive up the final price of the systems. In addition to that, these upgrades increase the switching costs because it is even more expensive to switch to another platform. Therefore, add-on reinforces the switching costs and therefore also the Lock-in effect.

In case of CityTouch, the lock-in effect is very dominant. Furthermore, CityTouch realized after the first three years of operation that the very high switching costs deter municipalities to buy the system. When a municipality has decided to install CityTouch-ready luminaires through the (entire) city, then the city is locked-in to CityTouch. The costs to switch to normal luminaires would be immense. Since the opening of the product component of the platform, the switching costs are still immense, but the dependency on one supplier is lower. Thereby, it gives municipalities more trust to invest in CityTouch when other parties also create CityTouch-ready luminaires. In that case, other luminaire suppliers ‘believe’ in the future of the CityTouch platform what then increases the trust and sustainability of the platform. Furthermore, the CityTouch platform service enables complementary services to the platform to become and stay the platform of choice. From this, we can conclude that when the switching costs are too high, customers are more afraid to buy the product and/or service. In that case, the main part of the investment risk lies with the customers (which can be a consumer of a business).

Figure 10: high switching costs
Developing an open platform is significantly more expensive compared to developing a platform with fixed partners. Third-party developers and complementary products and services should communicate perfectly with the platform provider. In case of Hue, high investments are made in enabling others to make apps for the Hue and to let complementary products communicate with the Hue bridge. In addition, controlling the platform to keep the quality as required for the customer satisfaction costs a lot of effort and money. Also for CityTouch, selling OLC’s to competitors and convincing them to manufacture CityTouch-ready luminaires required high investments. In order to become profitable, a sufficient installed base is needed as described earlier in this section. More parties creating value on the platform, will increase the installed base. Therefore, from the perspective of the platform owners, it is interesting to maximize the value creation on the platform by other parties. For example, Hue leverages on the value created by others through an increased installed base due to system sales. However, capturing enough value is crucial for other parties to create value on a platform. This leads to an important decision for a platform leader/provider, namely; how much of the created value do you capture, and how much of that value do you leave to the partners in the ecosystem. Hue decided to accept that all the value created on the service component will be captured by the third-party developers. This way, the value to capture for third-party developers is very high which makes the Hue platform an interesting platform for third-party developers. In fact, such a strategy where you leave value that you could have captured, to others in order to achieve platform growth, is a significant investment. Taking all the investments together, a ‘successful’ or fast growing open platform requires significant investments compared to closed platforms.

Because of these reasons, it is extra important to keep the customers in the installed base. If it is too easy for a customer to leave the platform, the platform owner will face very high risks about its return on investment. Therefore, Lock-in, and Add-on business model patterns are important mechanisms in order to maintain a stable installed base.

![Diagram](image)

**Figure 11: Low switching costs**

A last mechanism to keep customers in the installed base, is customer loyalty as discussed in section 5.1.5. When customers feel appreciated, it lowers the chance that the will move to another platform. Indeed, Hue connected its customer loyalty program (i.e. giving existing customer discounts on new additional products), to add-on purchases. These add-on purchases again lead to higher switching costs and thereby make it less likely that a customer will leave the platform.

The findings of section concerning the two case-studies with an partly open platform are summarized in figure 12. Partly open refers in this case to the possibility a PSS gives by opening only one of the two components.
5.2.4. Closed platforms

As showed in the matrix at the beginning of section 5.2, Medido and DirectLife have closed platforms with fixed partners in the ecosystem. A major difference is that Medido had an open business model from the beginning, where DirectLife did not have an open business model. DirectLife integrated the service in-house and Medido created the value of the PSS together with partners. This move of DirectLife is very unusual for a product-centric company without having experience in providing services. In exchange, the DirectLife platform monetizes fully on the product-component as well as the service-component due to not having an open business model. In terms of value creation and capturing, DirectLife captures all the value created by the platform. Medido on the other hand, has to share the value created among many ecosystem partners. This value distribution must be fair enough in order to make sure that all the partners want to stay in the ecosystem. Another advantage of the DirectLife PSS platform is that they are independent of other parties. Especially in product-service systems of where only the combination of product and the service creates appropriate value, it can be risky to be dependent of another party developing a component of the product-service system. In addition, an advantage on the other hand is the risk sharing among the partners of the ecosystem. Especially the investments can be shared in case of many partners providing the product-service system together. However, the case of DirectLife/ActiveLink showed that value sharing with partners can result in capturing more value compared to operating in an ecosystem without external partners as discussed in section 5.1.4. This depends entirely on the total value created by all the partners together in the ecosystem.

Another difference is that in case of the Medido, the ownership of the products stays with the company. The complete product-service system is leased for a fixed price per month. This construction is interesting when the purchase price of the product is relatively expensive for customers.
5.2.5. Advantages and disadvantages of open versus closed platforms
Bringing patterns and key learnings of the four cases, and the two conceptual frameworks together, pros and cons can be drawn of open platform compared to closed platform business models of product-service systems from the perspective of the platform owner.

See below the advantages and disadvantages of open platform business models compared to closed platform business models. See section 5.2.1. up to and including 5.2.3 for more explanation.

Advantages:

- A large increase of value creation on the platform by third-party developers.
  - The costs of R&D are ‘naturally’ shared among the partners in the ecosystem. The term naturally refers to the fact that third-party developers first have to innovate in a value adding product or service before it can enter the platform.
  - A possibility to leverage on the value created by other parties on the platform.
- Achieve the largest possible growth of the installed user base due to the large increase in value (see the previous point). Thereby, increasing the market share and maintain a stronger position in the market.
- Allow for mass customization with using relatively less resources and capabilities.
- Achieve a largest possible innovation speed (i.e. time to market); anyone who has value to add can immediately step into the platform.
- (endless) integration possibilities of other (complementary) products or services in order to stay innovative and deliver everything a customer needs.
  - Higher product quality and relevance for customers due to close interaction possibilities with customers and third-party developers.
- Low frictional costs for stakeholders in the ecosystem to connect to the platform. i.e. The platform owner has already set the structure and rules about how to connect to the platform.
- A possibility to ‘open’ just one of the two components of the PSS (this is of course limited to a platform consisting of a product and a service component). However, when keeping one side of the PSS closed ensures value capturing on that side of the platform.
- Joint-marketing campaigns which is more efficient and leads to costs savings per ecosystem partner.
Though, it has to be acknowledged that these advantages are not all even strong in comparing to closed platforms. A closed platform can for example also provide joint-marketing companies with one or more fixed partners of the ecosystem. However, in an open platform with continuous integration of new partners, there are more opportunities in order to do so. These advantages of open platforms can also be related to advantages of creating products and/or services together with partners in a business ecosystem.

**Disadvantages:**

The following points are disadvantages of an open platform compared to a closed platform business model.

- Less control over the platform and especially over the quality of products and services provided by the platform. In addition, an open platform is extra hard to manage due to the continuous movement in the number of partnerships.
- High(er) investments.
  - Investments to provide a platform architecture where other parties can easily connect to.
  - Investments in controlling the platform as good as possible.
  - In some cases, extra investments as in leaving value to capture for others in order to make the platform more attractive for third-party developers.

See the ‘practical implications’ section in chapter six for practical recommendations of these results about open versus closed PSS platforms.
6. Discussion

6.1. Theoretical Discussion and implications

The use of multiple qualitative case studies provides a rich opportunity for building theory in emergent areas that is grounded in empirical data. This section will place the results of this report into a broader theoretical field. Eventually this discussion will lead to the scientific implications, practical implications as well as suggestions for future research.

6.1.1. Product-Service system business model case studies

The four case studies evaluated in this research consist of tangible products and an intangible services, together fulfilling specific customer needs. Therefore, according to the definitions, all the cases can be evaluated as product-service systems (e.g. Tischner et al., 2002). The most cited and popular model is the model of Tukker (2004) who defined three categories of PSS namely, product-oriented, use-oriented and result-oriented (See figure 1). When moving from product-oriented to result-oriented, the intangible service value increases. However, from the use-oriented business model, where the product and service value is equal, only revenue options are given when the ownership of the product stays with the provider. Especially the case-studies CityTouch and DirectLife can be evaluated on the use-oriented category since the value of the service component is at least as high as the value in the product component. In addition, in these case-studies the ownership of the product component goes to the customer. In fact, these are examples of product-service systems according to the definitions, but do not fit he model of Tukker (2004). In case of DirectLife for example, this is mainly due to the reason that the product component is too inexpensive to use a construction where the ownership stays with the provider. The model of Tukker (2004) could be expanded with product-service system of which the product component is too inexpensive to use lease or pool constructions for example. The model by Tukker (2004) therefore is restricted to relatively expensive products and does not cover all the PSS cases. The only case which has such a use-oriented business model is Medido where a lease construction is used. In addition, the model of Tukker (2004) is more associated with sustainability in which product re-use and product lifecycle management are important factors (Rauter, Jonker & Baumgarten, 2015).

Next to that, most of the articles in the field of business models for product-service systems are based on an analysis of a single case-study (e.g. Azarenko et al., 2009; Evans et al., 2007; Mont et al., 2006). Therefore, a multiple-case study approach of business models for product-service systems gives the opportunity to compare business models and ecosystems, and come to a better understanding of choices and the impact of it. Creating new conceptual models based on a single case-study contains lots of restrictions concerning generalizability of the model.

6.1.2. Product-service system business model innovation in a product-centric firm

All the case-studies are part of different divisions of Philips which is originally a product-centric firm with the corresponding resources and capabilities. Therefore, it is interesting to evaluate the product-service system in the context of a product-centric firm. By developing product-service systems, the company achieves more customer-centricity (de Brentani, 1995; Kelly & Storey, 2000). Since a product-centric firm lacks resources and capabilities to develop the service component, partnerships can be conducted in order to develop a sufficient service component (Hakansson & Snehota, 2006). This is what happened from the beginning in all the cases except for the DirectLife case. Partnerships were conducted and revenue sharing took place from the beginning. In all the cases, the product-service systems have led to the collection of product and service usage data. That data is used in all cases to improve the product-service system gradually, and in a single case to identify new opportunities which
is in line with research of Ulaga and Reinartz (2011). In all the cases, ICT technology became an important factor of the service proposition and of the connection between the product and the service component. This confirms the conclusion of Gago and Rubalcaba (2007), who mentioned that service innovation relies on information and communication technologies.

According to Kindstrom and Kowalkowski (2009), many product-centric firms give away their service for free to support the sales of hardware. This is not typically the case in this research. Only Hue is using this approach. However, this is mainly due to the reason that Hue is focusing on a different strategy which will be discussed later in this chapter.

The sales of product-service systems is described as a major hurdle for product-centric firms by Edvardsson et al., (2013). This conclusion is confirmed by this research on the PSS to consumer sales as well as on the PSS to organization sales. Traditional B2B and B2C sales channels were insufficient in selling the product-service systems. In case of PSS to organization sales, the salespersons were unable to explain the value of the service component (kindstrom et al., 2012), and on the PSS to consumer sales was unsuccessfully experimented with large businesses as sales channels. It also confirms research from Ulaga and Reinartz, (2011) concluding that traditional product salespeople often do not fit the competence profile required.

Another point of issue is the product-centric firm’s ability to maintain a long-term relationship with the customer. The service component of the PSS brings the firm closer to the customer since the customer makes use of the service on a frequent basis (Kohtamaki et al., 2013). The first problem that emerged was the product-oriented customer care service, that was unable to handle the questions of the customers concerning problems with the product-service system. A community where customers can help each other, has emerged as a fast, efficient and reasonably priced alternative compared to a ‘service-ready’ helpdesk. In a more B2B setting, selling the PSS in terms of a long-term project helped to convince the customer that they are not just buying a product. In addition, two cases, CityTouch and Hue, showed a very proactive and reactive behavior in order to increase the probability that the customers will stay. The proactive behavior of CityTouch refers for example to the service innovation from local to cloud software that reduced the installation complexity significantly. Furthermore, Hue for example actively follows the user community in order to improve the service continuously with updates. This reactive and proactive behavior to positively influence the long-term relationship with the customer is in line with research of Kowalski (2008). He concluded that a firm needs a proactive-reactive balancing capability in order to determine how to react in different situations.

6.1.3. Transaction-based and platform business model view on product-service systems

Many authors relate a product-service system to an evolving network of partners (e.g. Baines et al., 2007; Mont, 2002; Evans et al., 2007). These networks are called business ecosystems or value networks in the literature (Baines et al., 2007). Tukker and Tischner (2006) argue that a product-service system in almost all cases is a result of a ‘dominant multi-actor network’ which can consist of financiers, users, suppliers and authorities. However, the current literature lacks more in-depth information about what for example such an ecosystem typically looks like or, what type of forms there are. In addition, almost no authors have linked the term product-service system to a platform based view on business models where other parties can add value with complementary or substitutional products and/or services. Such a platform oriented business model is equivalent to type 6; the most advanced business model, of the business model framework developed by Chesbrough (2007). He defines a platform business model as a model where key suppliers and sometimes customers become business partners, entering into relationships where both technical and business risks may be shared.
All cases including DirectLife since the partnership with Weightwatchers match with the platform business model definition of Chesbrough (2007). Furthermore, in addition of existing literature, roughly three types of platforms can be distinguished by the four cases. The first type is a platform where all the components are provided by the focal company. The second type is a platform with fixed partners, and the third type is a platform with continuous integration of new partners (i.e. an open platform).

The first thing noticed when combining the topics; product-service system with platforms, is that there is hardly no author who investigated this combination. In most cases, platforms are related typically to digital value propositions (e.g. Gawer & Cusumano, 2014; West, 2003). Since all the investigated case-studies in this research rely partly on digital value, comparing the results with the platform literature is still very relevant. The importance of the size of the installed base of a platform is a major point of focus in the literature, and is evaluated as a breaking point for platform survive (Evans, 2003; Rochet and Tirole, 2003). This is confirmed by the results where the focus and strategy is mainly on growth of the installed user base. Especially cases where the revenue model is focused on monthly monetization from the service component, the total revenue depends completely on the installed base. In the literature, such a strategy is named a ‘get-big-fast’ strategy and is often related to a ‘winner-take-all’ logic (Eocman et al., 2006; Besen & Farell, 1994; Caillaud & Jullien, 2003). CityTouch and Hue believe more in such a logic where eventually one platform ecosystem will ‘win’ and adapt their strategy on that logic. The strategy they use is to open the platform with a continuous integration of third-party developers.

6.1.4. Open versus Closed platforms for product-service systems

As already introduced in the previous section, Hue and CityTouch used a more open source approach in order to increase the installed base and the attractiveness of the platform. The cases DirectLife and Medido can be named closed platforms since they do not require continuous integration of new parties. Here the collaboration is limited to a selected number of firms (Smedlund, 2015). Current literature about open platforms considers open source software platforms (e.g. Gawer & Cusumano, 2014) or open source hardware platforms (e.g. Honegger, Meier & Tanskanen, 2013). In addition, in most articles, a platform can be open or closed. However, a product-service system adds a new dimension to this discussion by providing the ability to only open one side of the platform, namely, the product or the service side. This way, a product-service system platform can be considered partly open. West (2003) already concluded in his research that most of the platforms named ‘open’ or ‘closed’ in literature are not completely open or closed. His argument is based on ‘rule-setting instruments’ which gives platform owners the ability to select third-party developers on the basis of several rules (Boudreau et al., 2010). In addition, opening the product component of the platform and keeping the service component closed or vice versa can be considered as a new dimension of ‘partly’ open platforms.

The data from in-depth interviews showed a relation with whether the customer segment is a business or a consumer. A technology brief of Philips internal researcher Holtman (2014) mentioned that consumers do not expect to pay for purely digital value. The market answered to this problem by using a Grow-and-Squeeze business model (Holtman, 2014). In this model, first growth gets created by being as free and frictionless as possible to all users and ecosystem third-party developers. Second, after customers are used to the service (locked-in), add a monetization mechanism, even if it creates pain for users and ecosystem third-party developers. Holtman (2014) argues that this business model should not be the new standard for Philips because it will lead to unsatisfied customers, and therefore a less strong brand. A product-service system platform like the Hue provides a good answer to these disadvantages described by Holtman (2014). The digital service component of the Hue serves to
achieve more product sales. Therefore, it is in line with the conclusions of Holtman (2014); that monetizing on the hardware component will be better compared to the digital service component.

On the other hand, businesses still expect to pay when they take delivery of new software or data (Holtman, 2014). CityTouch is using that logic by focusing its monetization on the digital service proposition. In that case, the product component is open in order to attract third-party developers to make compatible luminaires.

Opening a platform requires significantly more investments compared to keep the platform closed (Boudreau, 2010). The literature refers to investments concerning platform coordination and an open platform architecture (Gawer and Cusumano, 2002). However, from the business model perspective, capturing less value in order to attract more third-party developers can also be seen as an investment. For example, Hue allows app creators to capture all the value coming from the app while they are making serious investments to keep the app compatible for the Hue.

A lock-in element has emerged as an important factor in order to keep control of the installed base, and to achieve a sufficient return on investment (Economides & Katsamakas, 2006). This is especially relevant to open platforms since extra investments has to be made. On the other hand, customers usually fear a lock-in i.e. high switching costs (Farrell & Gallini, 1988). The product component of a product-service system almost automatically solves this problem, because with a product there is always a lock-in effect to some extent. In addition, add-on products and service features increase the lock-in effect gradually. The CityTouch case results add to this discussion that opening one side of the PSS platform can be a good solution in order to decrease the lock-in effect.

6.1.5. Value creation and value capturing in platform-type product-service systems

Value creation and value capturing are important goals of a business model (Dorf & Byers, 2005). Especially when the value creation and capturing takes place in a network of different actors. This topic was introduced by Teece (1986) what contains the dilemma of who can benefit from innovation to the contractual conditions surrounding the innovation (and innovator), as well as the nature of the relationships between the innovator and the other network actors.

As explained in section 6.1.3. roughly three types of platform-type product-service systems can be distinguished in the cases. These differences in platform architecture has major implications for value creation and value capturing of the platform. In all the cases, including DirectLife after the partnership with WeightWatchers, value creation and value capturing occurs in a networks of actors. This is in line with the by Hamel (2000) introduced “age of revolution” of network oriented business models.

Zott and Amit (2007) mentioned that the association between business model design and focal firm performance can be analyzed by looking at two distinct effect. Namely, the value creation potential and the focal firm’s ability to capture a significant part of that value. The design themes they introduced were efficiency-centered business model design and novelty-centered business model design (See section 2.1.2. for an explanation of these constructs). All the cases evaluated in this research can be evaluated as high on Novelty-centered. This is because of the connection of several new partners in the ecosystems, and by designing a product-service system together with partners. Amit and Zott (2001) mentioned that such business models could include ‘lock-in’ and ‘complementarities’ value-creation designs which emphasize the bundling of goods, activities, resources or technologies. This is confirmed by the business models of CityTouch and Hue which contain both of the design elements. In addition to the switching costs (due to lock-in design) towards customers, Zott and Amit (2007) also discuss switching costs towards other business model stakeholders. The greater the focal firm’s bargaining power towards these stakeholders, the greater
its ability to appropriate rent. This is an important mechanism for value capturing by the focal firm. This consideration is confirmed by the this research, especially in the case CityTouch. In that case, other parties had to invest a lot of resources and capabilities in order to produce CityTouch ready luminaires. And with that CityTouch ready luminaires, they are completely dependent on the focal firm. However, it also showed that the switching costs could be too high for stakeholder which can deter them from creating value on the platform.

Since the components of the evaluated product-service systems only create appropriate value together in a value proposition, the component providers depend highly on each other (Jacobides, Knudsen & Augier, 2006). In all the cases incept the DirectLife case after the partnership with WeightWatchers; Philips is platform owner and therefore has the opportunity to shape the architecture of complementors around them, and think strategically about how to organize the set of other participants. Thus, these innovations required the creation of a new architecture. Jacobides et al., (2006) mentioned that such a managing or influencing role on the business architecture can allow a firm to capture a disproportionate high amount of the value created by the innovation. However, the cases evaluated in this research showed a more contradictory situation where the platform leaders did not capture enough value (Medido), or deliberately left value to capture for other parties in order to achieve platform growth (Hue and CityTouch).

Another interesting discussion is the control of the PSS complements in the ecosystem. Here is roughly the choice to on the one hand buy or build the complementary component yourself (DirectLife), or on the other hand to enter a partnership with a company providing the complementary component. With the assumption that entering such a new terrain implies a loss of efficiency in comparison to experience operators (Barney, 1999), it is the question if the value of controlling complementary components in a new line of business necessarily compensates for the loss of efficiency. However, it is obvious that the control of such a complementary component is very important since the product and service component of the PSS highly depend on each other. In addition, developing complementary components ‘in-house’ could assess the possible loss of activities that would promote the growth of the platform (Boudreau, 2005). This logic is confirmed by the cases, Hue and CityTouch by continuously trying to attract complementary component providers to add value on the platform. This logic is also in line with Jacobides et al. (2006) who mentioned that focusing excessively on value capturing impedes value creation. This is confirmed by the case of DirectLife; they focused to build the whole PSS proposition in-house in order to capture value, but failed in creating appropriate value for their customer segment.

On the other hand, Hue created a platform architecture that attracts actors to provide value on the platform. They facilitate entry and competition on the service component, without participating actively in these parts of the value adding process. So we can conclude that the success of Hue is due to the creation of an open platform architecture and a convenient rules of the game. Combining this with the earlier described advantages of a product-service open platform structure, it allows Hue to allow competition in the complementary asset provider (the service component of the PSS) rather than in their own segment (the product component of the PSS). Due to this advantage, Hue can afford it not to invest more in the complementary component than providing ‘just’ the open architecture.

6.2. Practical Implications
This report contains in-depth information about four product-service systems from a business model perspective. In addition, important decisions made in the business models are included and analyzed. These cases can serve as inspiration point for product-service system business model development in product-centric firms. Furthermore, the results of case specific decisions and outcomes can be used to focus business model discussions in similar situations. For example, DirectLife decided after
disappointing sales results to find a business partner with the right customer segment. This was needed to survive because they were not able to efficiently reach the right customer segment fast enough. In a similar sort of situation, this successful business example can be used. Next, every case has a unique business model including a unique combination of patterns. Also existing product-service system can use the key learnings of the evaluated cases to improve its business model.

The cases analyzed in this report show a large variation in PSS platform design and associated strategies. At the beginning of PSS business model development, a decision has to be made about opening the business or not. Here openness refers to the inclusion of outside partners into normally closed value creation processes. This choice is very important because setting a certain platform architecture will have consequences for the other choices. A very important element here are the resources and capabilities of the platform leader. As a product-centric company, it will be more efficient to agree on partnerships for the service component since the development of products and services is completely different process. However, creating a PSS in such an open business model has major consequences for revenue sharing i.e. value capturing and risks. On the one hand, the risk are bigger because in an open business model, the platform pleader depends on other actors. But on the other hand, since the risks can be shared among the different partners in the ecosystem. In the most cases, creating value with different partners in an ecosystem will be the most effective choice. Here, the investments in product and service components are lower, the risks can be shared and such an open business model architecture can be designed in many ways in order to get competitive advantage. The conclusions and key learnings of the cases DirectLife and Medido can be compared in order to make a decision.

When the choice is made to create an open business, the choice has to be made to open the PSS platform (and allow continuous integration of partners to create value) or not. When the product-service system allows integration of other complementary products and/or services, opening the PSS platform is an effective way to increase the value on the platform. If the product-service system is placed in a more niche market, it could be more effective to have closed PSS platform design and build the PSS with a few fixed partners. In such a closed PSS platform design with fixed partners, risks and investments can be shared, and clear agreements can be made in order to keep control of the platform.

Opening the PSS platform for continuous integration of new partners provides large challenges in keeping control of the quality and value capturing of the platform. However, a product-service system provides practical implications that can reduce the loose of control and can solve value capturing issues. Opening only one component (the service component or the product component) of the PSS platform implies control and value capturing on that still closed PSS component. Here the closed PSS component services as the platform control point. When the PSS is delivered directly to consumers, opening the service component of the PSS will be more efficient in case of a product-centric company as platform leader (see the Hue-case conclusions and key learnings for more arguments). On the other hand, in case of delivering the PSS to organizations, opening the product component could be a better solution. This is mainly because organizations are more likely willing to pay for digital service value, and because organizations normally have more problems with depending on a single hardware provider (See the CityTouch-case conclusions and key learnings for more arguments).

However, an open PSS platform requires significantly more investments compared to a closed PSS platform. This is mainly because of the costly open platform architecture, and the value the platform owner have to leave to complementary product providers in order to make the platform attractive. This is especially the case in the beginning when the installed base is relatively small. However, in order to keep control of this investments, ‘lock-in’ and ‘add-on’ are important business model design patterns. When there is a very low lock-in, or there is no lock-in possible, than a platform owner should
wonder if the return on investment risks are not too high. Therefore, lock-in is an important business model design element to build in the business model. In addition, the add-on business model design element is very effective to gradually increase the switching costs and therefore the lock-in effect.

Finally, the PowerPoint tool developed on the basis of these care-studies combined with external case studies can be used as practical source of inspiration. The cases can easily be compared and serve as examples in designing platform business models for product-service systems.

6.3. Limitations
Such a qualitative theory building always runs the risk of being idiosyncratic and not generalizable to the entire population (Eisenhardt, 1989). The identification of limitations can qualify this study, and can be the starting point for future research. In this case, where all the product-service systems were developed in a originally product-centric firm, the theory may not by applicable to product-service systems developed in a more service-oriented firm. There is also the risk of attempting to generalize of a still emergent topic. Such external validity is very important in theory-oriented research (van Aken et al., 2012). The adoption of open source platforms is still a relatively recent phenomenon. In addition, the lack of concrete performance data made it hard or even impossible to make statements about business model performance.

The number of respondents for the in-depth interviews is relatively low compared to the orientating and case-exploring interviews (see table 4). However this is maybe not such a big problem because of the exploratory nature of this research. A lot of effort has been put into selecting the most relevant cases given the unique combination of research topics. Since the research perspective was very large, it was hard to reach a point of data saturation. However, because of the explorative nature of the research. In case of using a more narrow research perspective, the research would not have reached its current status. Because of a multiple-case research perspective, it was not possible to interview many respondents per case due to time constraints which is also a limitation concerning respondents and reliability. Different people can have different conceptual schemes, different values, different observations and draw different conclusions (Van Aken et al., 2012). Therefore, having more respondents per case from different backgrounds would have increased the reliability.

In addition, the relevant topics differ per case which increased the complexity of comparing the qualitative data. The semi-structured interviews provided room for focusing on case-specific relevant topics However, it decreases the comparability of the data. Another limitation is that all the case-studies were part of the same product-centric firm. Therefore, using the theoretical models in other product-centric firms may be unreliable.

The interviews and the coding were performed by one person which is a limitation because no inter-rater reliability is carried out. Additionally, not all the data coming from the interviews could be validated with other resources which can lead to bias in the data. Next to that, the interviews are carried out by one person which is a limitation because the quality of the data depends upon the personal characteristics of the interviewer. The conceptual frameworks provided by this multiple-case study research are not validated or tested which is a limitation on internal validity.

6.4. Future Research
Since PSS and platform-type business models are still emerging topics in the academic literature, more research is needed in this field. Especially the combination of platform-type business models and PSS is a large gap in the literature. In this research, four case studies are analyzed in order to find the patterns and key learnings. In order to validate the conceptual theoretical frameworks developed by this research, more PSS cases should be investigated. In addition, this research indicates that for
product-service system innovation from a business model perspective, multiple aspects remain to be addressed. The PSS business model patterns investigated by this research require more in-depth research. For example, future research should indicate the possibilities of the emerging business model pattern ‘leveraging customer data’ more deeply. In addition, this research explains pros and cons of open versus closed PSS platforms. However, future research could provide more arguments why to choose for and open or a closed platform design in relation to the PSS. In other words, for what type of PSS and what type of market works a closed or open PSS platform design the best?

Additionally, it would be interesting to research cases with performance data. By comparing PSS platform-type business models with actual performance measures, conclusions can be drawn about the performance of a business model. Especially, open platform PSS architectures are interesting to investigate in combination with performance indicators. This is because literature lacks any content about open PSS platforms.

Furthermore, it would be interesting to investigate PSS platforms success more from a strategic perspective. Bonchek and Choudary (2013) defined three factors of a successful platform strategy namely connection, gravity and flow. Connection refers to how easily others can plug into the platform to share and transact. Gravity to how well the platform attracts participants and flow refers to how well the platform fosters the exchange and co-creation of value. Since these factors are tested with pure digital platforms, it would be interesting to test these factors with PSS platforms. For example, on a PSS platform with an open hardware component, the factor ‘connection’ can be relatively low since it requires significant investments to produce complementary hardware on a platform. By using these factors, strengths and weaknesses of specific PSS platform architectures can be further researched.

This research is carried out from the perspective of a product-centric company. In addition, it would be interesting to perform this research with case studies from a company with another background. For example, innovating into product-service oriented value propositions from a service-oriented business will could have completely different challenges concerning business model adjustments.
7. Conclusions

This study addresses a platform-type business model view on product-service systems. It argues that platform-type business models are very relevant for product-service systems, and therefore deserve more attention in academic literature. Nowadays, such a platform viewpoint is primarily associated with software and digital value (Gawer and Cusumano, 2014). However, this viewpoint in combination with product-service system can lead to competitive advantage for product-centric firms.

This study highlighted the challenges of the shift from traditional product-centric business models to more platform-type business models. By using in-depth case-study material, this study showed how such PSS platforms can be visualized, and how different partners are connected in order to create on, and distribute value of the platform. In addition, with the creation of PSS platforms, the installed base of the platform is of major importance in order to survive. Furthermore, value sharing with the actors in the ecosystem becomes a new challenge for product-centric firms. Here all the platform actors have to capture enough value in order to survive and keep creating value on the platform.

Additionally, combinations of several business model patterns can characterize the PSS platform business models. Digitization, Leverage customer data, Mass customization, revenue sharing and customer loyalty emerged as typical PSS business model patterns. The combination of these patterns can be considered as the basis for a PSS platform business model. Furthermore, some interesting differences are distinguished in the PSS platform business models. Cross-case analysis showed that these differences mainly emerge out of the different platform architectures.

This study extends the platform-type PSS business model view provided by this study with different platform architectures. First of all, it showed that such a PSS platform can consists of cooperation with different partner in a business ecosystem, or can be developed completely by the platform owner. In case of developing and providing a PSS together with partners, the study showed that it can be in an open or a closed PSS platform structure. In a closed platform architecture, a business benefits from more control on the investments and risks of the platform. In addition, in case of an open PSS platform architecture, this study provided new platform designs which can lead to competitive advantage. Where traditional digital open source platforms are completely open, a PSS open platform allows to only open one of the two main components of a PSS (the product component or the service component).

Opening one component instead of the whole PSS platform insures the platform owner of capturing an appropriate proportion of the value provided by the platform. Especially, that will be the case for PSS with a high dependency between the components (i.e. the components little value with single use). In such PSS cases, opening one component leads to an increase in the installed base of the platform, and therefore in an increase in value capturing by the platform owner on the closed PSS platform component.

Finally, this study showed that an open PSS platform design contains significantly more architecture-related costs compared to a closed PSS platform design. Therefore, ‘lock-in’ and ‘add-on’ are important business model design patterns to decrease the risks concerning the return on investment. Without switching costs, customers can switch easily which is risky in terms of platform revenues. However, this study also indicates that too high switching costs can deter customers from adopting the platform. Therefore, the height of switching costs has an optimum depending on each case specific.
References


## Appendix I

Table 1. What is a business model?

<table>
<thead>
<tr>
<th>Authors</th>
<th>Definition</th>
<th>Focus of analysis includes</th>
<th>Notion of Model</th>
<th>Examples include</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tyre</td>
<td>How a firm delivers value to customers and converts payment into profits</td>
<td>Situates the business model concept</td>
<td>Kinds and Types; Role Models</td>
<td>Soft meat packers, Sea Land containers, Netflix online DVD rental</td>
</tr>
<tr>
<td>Zott &amp; Amit</td>
<td>... a system of interdependent activities that transcends the focal firm and spans its boundaries.</td>
<td>Relates business model innovation to technical innovation.</td>
<td>Kinds and Types</td>
<td>Exp, Inditex (Zara), First Data Corp, FiatSc (start up in lubrication)</td>
</tr>
<tr>
<td>Williamson</td>
<td>... cost innovation business model offers advantages in radically new ways meaning more for less.</td>
<td>Emphasizes interdependencies beyond firm boundaries. Good design requires Content (what), Structure (links) and Governance (who does what).</td>
<td>Role Models to follow</td>
<td>Shanghai Zhenshan Port, Machinery, Haier refrigeration</td>
</tr>
<tr>
<td>Gambardella &amp; McGahan</td>
<td>Business model a mechanism for turning ideas into revenue at reasonable cost</td>
<td>How low cost business models from China (and India) work.</td>
<td>Role Models</td>
<td>Nanoe car - Tata</td>
</tr>
<tr>
<td>Itami &amp; Nishitake</td>
<td>... business model is a profit model, a business delivery system and a learning system</td>
<td>Business model innovation in high technology sectors that allows small firms to capitalise on their ideas.</td>
<td>Scale Models or short-hand descriptions</td>
<td>Many references including Google, Apple, Ideas, Yopitech + biotech start-ups</td>
</tr>
<tr>
<td>Yuan, Moingeon &amp; Lehmann-Ortega</td>
<td>A value system plus a value constellation</td>
<td>Puts learning centre stage, classification by firm systems</td>
<td>Role Models and Model Organisms</td>
<td>Toyota and Google</td>
</tr>
<tr>
<td>Candeuris &amp; Ricart</td>
<td>The logic of the firm, the way it operates and how it creates value for its stakeholder</td>
<td>A social business model that lies between profit and charity</td>
<td>Role Models</td>
<td>Grammen Bank + Telemor, Vanilla and Danone collaborations</td>
</tr>
<tr>
<td>Densil &amp; Lecoq</td>
<td>The way activities and resources are used to ensure sustainability and growth</td>
<td>Interfaces between business model, strategy and tactics</td>
<td>Models capable of manipulation</td>
<td>Rim Air, Tefmore/TEC</td>
</tr>
<tr>
<td>Sabater, Rousseau &amp; Mangenot</td>
<td>Cross roads of competence and consumer needs</td>
<td>Dynamics of business model change over time</td>
<td>Model Organisms</td>
<td>Arsenal FC</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Portfolios of business models</td>
<td>Recipes</td>
<td>French biotech firms</td>
</tr>
</tbody>
</table>

Source: See text.
Appendix II
Part A: General questions business model and value network

The goal of the first interviews is to fill in the business model canvas for each case-study and to make a first sketch of the value network. In order to do this as effectively as possible, first, An empty business model canvas and an example of a value network will be showed to the respondent. Next to that, the following questions will be asked to obtain a complete view about the business model and value network. See the questions for each of the business model canvas below. The questions are in Dutch because most of the interviewees speak Dutch as their native language. In case of an English speaking interviewee, the questions will be translated in English.

1. Customer Segments
   - Welke specifieke klanten (groepen) worden bedient door de waarde propositie? Wat zijn de behoeften van deze klanten (groepen), en zijn hier veranderingen in opgetreden door tijd heen?

2. Value Proposition

3. Customer Relationships
   - Hoe onderhoud je de contacten met de verschillende klantsegmenten? Welke manier is voor elk segment de juiste en meest rendabele? Hoe weet je dit zeker?

4. Channels
   - Hoe worden klanten(groepen) bereikt met de waarde propositie? Hoe ervaren zij de waarde propositie van het product-service systeem het beste? Hoe kunnen ze het kopen en verkrijgen? Zijn hier zaken in verandert gedurende het ontwikkelingsproces?

5. Revenue Streams
   - Via welke stromen wordt het geld verdient met de waarde propositie? Met welke verdienmodellen is geëxperimenteerd?

6. Key Resources
   - Welke hulpbronnen zijn er nodig om de waarde propositie te creëren? Zowel voor de distributie, het onderhouden van klantenrelaties, en voor het verkrijgen van nieuwe klanten?

7. Key Activities
   - Welke kernactiviteiten zijn essentieel om de waarde positie te creëren of te versterken? Hoe worden de klantenrelaties onderhouden? En potentieel nieuwe klanten bereikt?

8. Partners and value network
   - Welke partnerships zijn essentieel om de waarde propositie te maken of te co-creëren? En hoe gaat dit precies in zijn werk? Welke ontwikkelingen hebben hierin plaatsgevonden gedurende de ontwikkeling van het product-service systeem?

9. Cost Structure
   - Welke kosten zijn essentieel om het product-service systeem te laten functioneren? Welke hulpbronnens en kernactiviteiten zijn het meest kostbaar? Welke kosten zijn vast en welke zijn variabel?

Part B: Business model and value network innovation process

This part of the interviews will focus on investigating the (past) business model and value network innovation process. The business model canvas, and the value network derived from interviews in Part A will be evaluated first with the interviewee. Next to that, a list with project descriptions will be showed and where necessary added. The next questions
will focus on the most important changes in the business model and value network innovation process. See the complete scheme with questions below:

1. Klopt de business model canvas en het value network volgens u? Zo niet, wat is er precies anders?
2. Vanuit welk initiatief is het project destijds gestart? Welke actoren met welke rollen waren er vanaf het begin bij betrokken?
3. Welke veranderingen in het business model en value network zijn er opgetreden door de tijd?
   - Wat is er precies veranderd (Op welke delen van het business model/value network heeft de verandering effect gehad)?
   - Wat was per verandering de trigger? En waarom is het uiteindelijk veranderd?

Part C: Additional, more in-depth Business Model related questions

This part of the interview scheme will focus on more theory related in-depth questions about product-service system business model development from a business model perspective. These questions are derived from critical points of PSS business model innovation found in scientific literature.

PSS offer and development (What)
- Was er tijdens de ontwikkeling van het PSS sprake van twee verschillende units (NPD unit en een NSD unit)? Zo ja, hoe verliep de samenwerking tussen deze twee units?
- Lag de focus meer op het creëren van een oplossing voor de klant, of juist meer op het ontwikkelen van de technologie tijdens het PSS ontwikkelingsproces?
- Wat zijn de verschillen in het ontwikkeling proces tussen de service component en de product component van het product-service systeem? En waar komen deze verschillen door?
- Hoe zijn de potentiële klanten betrokken geweest bij het ontwerp van het concept? Al vroeg in het ontwikkelingsproces of pas later? En in welke fases van het ontwikkelingsproces precies? (concept fase, concept testing, business case, ontwikkeling, testen, introductie)

Customers (Who)
- Wat voor belangrijke zaken relevant voor het business model worden er afgesproken met de klant? (contracten)

Infrastructure (How)
- Hoe wordt monitoring system data gebruikt ter verbetering van het product-service systeem?
- Worden sales mensen speciaal getraind voor het aanbieden van het product-service systeem? En hoe wordt dit gedaan?
- Welke ontwikkelingen hebben plaatsgevonden in het value network gedurende de ontwikkeling van het product systeem?
- Hoe zijn de risico’s en verantwoordelijkheden verdeeld onder de verschillende partners in het value network?
- Hoe wordt er precies gecommuniceerd in het value network? En hoe frequent gebeurt dit?

Profit equation (Value)
- Met welke verdienmodellen is geëxperimenteerd? (prijs per service delivery/ prijs op basis van aanwezigheid/ prijs op basis van prestatie etc.)
- Hoe is de prijs voor de service component bepaald? Is er in deze prijsbepaling naar andere verdienmodellen/voorbeelden gekeken?
- Waarom is het huidige model gekozen?
- Hoe worden inkomsten verdeeld onder de verschillende partners in het value network?
Interview (English shortversion)

1. Is the business model correct in your opinion? If not, What are the differences?
2. What was the initiative to launch the project in the beginning? Which actors were involved from the beginning?
3. Which important business model and value network related changes have occurred over time?
   - Which part(s) of the business model and/or value network were affected by the change?
   - What was the reason to change?

In-depth questions:

PSS offer and development (What)
- Were their two different units during the development process? An NPD unit and an NSD unit? If yes? How did the units cooperate?
- Was the focus more on creating a solution for the customer? Or on the technology development part during the PSS development process?
- Were their specific differences in the development process of the service component compared to the development process of the product component?
- Were potential customers involved in the design of the PSS? If yes? How and in which stage of the product-service system development process?

Customers (Who)
- What important things relevant for the business model have been agreed with the customer in the form of a contract? (for example performance contracts)

Infrastructure (How)
- Is monitoring system data used to improve the product-service system? If yes, How exactly?
- Are sales people specially trained to offer the product-service system? If yes, How exactly?
- How are the risks and responsibilities divided among the different partners of the value network?
- How and how often takes communication place between the different partners of the value network?

Profit equation (Value)
- With which other revenue models is experimented during the business development phase? (price per service deliver/ price for availability/price per performance outcome etc.).
- Have existing business models/revenue models of other companies/products inspire you?
- How is the price for the service component determined?
- Why is the current revenue model chosen?
- How is the profit divided between the different partners of the value network?
### Appendix III

Business model canvas supporting quotes for the Hue.

<table>
<thead>
<tr>
<th>Business Model Canvas Block</th>
<th>Quote</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Customer Segments</strong></td>
<td>“We don’t focus on the business segment. We focus on residential people. Of course there are many opportunities we are investigating, to sell to small business for example” (George Yianni)</td>
</tr>
<tr>
<td><strong>Value Propositions</strong></td>
<td>“De value proposition is een connected LED-lamp. En de onderscheidende waarde zijn de kleuren, en de sfeer die je daarmee kunt creeren” (Rob Jaartsveld)</td>
</tr>
<tr>
<td></td>
<td>“Personalisatie heeft in dit geval dus puur te maken met dat je de tinten zelf kan instellen, maar ook sfeer instellingen die dus meerdere lampen tegelijk treffen” (Rob Jaartsveld)</td>
</tr>
<tr>
<td><strong>Channels</strong></td>
<td>“Attent desire, which is very hard to communicate. And that’s the problem with our product. There is no awareness, there is nod rive for consumers for it. It is extremely desirable if you getting to understand it. So what we were actually looking for, was where can we sell this product? Who really can explain it to people? And where can we sell it somewhere where it immediately gets credibility. Luckily Apple supported our vision.” (George Yianni)</td>
</tr>
<tr>
<td><strong>Customer Relationships</strong></td>
<td>“We facilitate the Hue community, We use the data, and share the things they have created. We facilitate and help and promoting” (George Yianni)</td>
</tr>
<tr>
<td></td>
<td>“A major thing that happens in our system, and which you don’t have in typically products (at Philips). Is that we have an ongoing customer relationship with the customers to make them constantly aware of new functionalities and features and new product launches. So we are trying to build this ongoing dialogue with them to get them to use lighting in richer ways. And as a result of that actually, a major source of sales is that people extending their systems” (George Yianni)</td>
</tr>
<tr>
<td></td>
<td>“And with the bigger partners (Like Next), we also work together in joint marketing campaigns. Or even like joint merchandising in shops to help promote the combination” (George Yianni)</td>
</tr>
<tr>
<td><strong>Revenue Streams</strong></td>
<td>“We don’t get service revenue, we get money from hardware sales. But actually we do provide the service to our customers, we give it away for free. So we sell our hardware bundled with services. Which is actually, we maintain you an ecosystem which continuously give you more use cases. And the way we actually monetize the services, is that it drives additional system sales”</td>
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<tr>
<td></td>
<td>“I believe at a certain point, you will have a big enough installed base, that it sells itself, we can do that. And create a new revenue stream”</td>
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<td></td>
<td>“We are a very asset-heavy. To cover all the assets, we have to make big revenues. A service business has very high profitability and very asset light, very few people and very few component assets. It’s fine to not make that much money for a service business because you have for example 80 percent margin”</td>
</tr>
<tr>
<td><strong>Key Resources</strong></td>
<td>“We use the Hue community as a key resource to improve our knowledge about the customers”</td>
</tr>
<tr>
<td><strong>Key Activities</strong></td>
<td>“Now, what we are constantly doing, is trying to persuade our existing customers to buy more products to connect their system. We do that by offering lots of new things you connect. So we just launched the new portable light. Last year it was switches, next year it will be sensors etc.”</td>
</tr>
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<td></td>
<td>“It’s not just our app, we have opened the app, so there are a lot of third-party apps which attract people to develop more”</td>
</tr>
<tr>
<td></td>
<td>“Next to the phone apps, we also put a lot of time in partnering with third-party subscriptions like with Nest”</td>
</tr>
<tr>
<td></td>
<td>“Yes but also, we launched the hue tap, and build some features in our app, which lead to 15 new apps launched which can do more sophisticated things which were only enabled by launching that new system feature. So we help to promote these applications”</td>
</tr>
<tr>
<td></td>
<td>“We keep interacting. In die end, we update the software for the bridge six to ten times a year. The app updates maybe 20 times a year. So I mean we do a lot of software updates”</td>
</tr>
<tr>
<td></td>
<td>“De lampen zijn heel innovatief, maar ze zullen in kostprijs omlaag moeten om een groter publiek te kunnen addresseren”</td>
</tr>
<tr>
<td></td>
<td>“Momenteel is met continu bezig met het innoveren van deze lampen”</td>
</tr>
</tbody>
</table>
| **Key Partnerships**         | “Well, the way we think about the model: The idea with these platform based ecosystems, is they snowball it self-sustainment. So we have our user, and basically, we
have our third party apps and we have our system. So what we do, is the third party apps, they give use-cases to the customer. As we increase use cases, it makes the system more desirable, so that increases the system sales”

“The interesting about it is, this gives us a bigger installed base, which attracts more third party developers, and actually, a bigger installed base, more third party apps, this is meant to be self-sustaining cycle. What we do, in order to accelerate the speed of the self-sustaining cycle, is we inject features which enable new kind of applications, and we promote these so that the user is aware of these. And the way we monetize out of this, is we do more sales of systems, and we do more sales of lightbulbs.

### Cost Structure

“We also have noted that offering the service is very expensive. We don’t directly monetize, but it is expensive. I would say, if we look at the cost price, 75 percent is hardware shipping etcetera, and 25 percent is the costs of operating the service”

“I mean, also providing the service and adding features, we spent 10 million plus a year on adding features”

“Als je kijkt naar de kostenstructuur hebben ze de kostprijs voor het maken van de lampen en de bridge, oftewel de klassieke productiekosten inclusief distributie. Maar daarnaast hebben ze dus ook nog die diensten lopen om de lampen bereikbaar te maken op het moment dat je buiten de deur bent”

### Business model canvas supporting quotes for DirectLife

<table>
<thead>
<tr>
<th>Business Model Canvas Block</th>
<th>Quote</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Customer Segments</strong></td>
<td>“All ages is not necessary true. Its adults (18+). We have done some experiments with children. And the feedback was mostly a confirmation of our hypothesis, and that is that it is too boring for children. So adults it is. And the customer relations is the contract between the coach and the client. And that party is now transferred to weightwatchers”</td>
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<td></td>
<td>“DirectLife richt zich vooral op bedrijven die hun werknemers willen stimuleren om meer te bewegen. Ze hebben bijvoorbeeld bij Philips een aantal succesvolle pilots gedaan. Waarbij de dienst aan een bedrijf wordt verkocht, en de werknemers een jaar gratis de dienst kregen.”</td>
</tr>
<tr>
<td><strong>Value Propositions</strong></td>
<td>“DirectLife had vanaf het begin een dienst voor ogen. Het begon natuurlijk wel met een activity meter. Dus als je mensen een meterjte meegeeft gaan ze meer bewegen. Je kan dus zelf een doel instellen, en vervolgens zien of je het doel hebt behaald. Zo is het begonnen”</td>
</tr>
<tr>
<td></td>
<td>“We realized that a 3rd axis is needed to the system (human coaching). They already had the hardware, they had a rough version of the software, but they noticed that they needed a human coach. Although it was important to make the human coaching scalable. And also to use the learnings from the coaching into the total proposition. The model we were working on was by iteratively learning and testing we would bring the learnings into the proposition”</td>
</tr>
<tr>
<td></td>
<td>“the 3M model came in super early. Only having measurement and monitoring would not create lasting change. So if we want people to really achieve a healthy lifestyle, but they are not able to do. There is always an “intention behavior gap”, where people want to make a change but they are not able to perform to do it”</td>
</tr>
<tr>
<td><strong>Channels</strong></td>
<td>“Ze werken nog steeds met grote bedrijven maar ze promoten het niet meer actief. Toen ik ze sprak hadden ze nog 5000 active users. The lesson learned was: het gratis weggeven werkt niet als mensen niet gemotiveerd zijn. Dan is het heel snel einde verhaal”</td>
</tr>
<tr>
<td></td>
<td>“So we had a lot of distribution channels via partnerships. So weh ad a B2B business model initially. We focused on Fortune500 companies to pilot with, and in that pilot, the distribution went direct to their employees”</td>
</tr>
<tr>
<td></td>
<td>“So rolling it out to all the employees; typically what happened is first you get the people who are already quit active, and thus don’t need the service. So that is an issue”</td>
</tr>
<tr>
<td></td>
<td>“Another problem is that you also have people that are not even aware that they need to get more active by themselves, we also got a lot of resistance from them”</td>
</tr>
<tr>
<td><strong>Customer Relationships</strong></td>
<td>“And the fee for the coaching was not dependent on how much coaching have been used. The working element of that model. And there you should be more specific; was the unlimited reactive coaching, which means that there is one coach who you talk to”</td>
</tr>
<tr>
<td></td>
<td>“There is data monitoring to check if its correct that you don’t need it. Because you might thing that you don’t need it but if the coaches see no movements, that he or she will sent a personal massage”</td>
</tr>
<tr>
<td></td>
<td>“But then you reach the organization which is product focused. Basically the helpdesk had two questions. The first: is it broken? And the second, do you still have warranty?”</td>
</tr>
</tbody>
</table>
“But the consumer service get calls like, well my activity monitor does not work. And an activity monitor doesn’t break. So then they get other problems, and have to get more into that. The consumer case of Philips had no idea what to do with that”

**Revenue Streams**

“Nee, je koopt een abonnement, de initial fee is 39 euro, en daarna betaal je maandelijks 5 euro. De helft gaat naar Weightwatchers en de helft naar Philips”

“And here the knowledge form the fitness center comes in. People have a subscription at a fitness center don’t cancel it. Because the moment they are thinking about cancelling it, they are going to the gym because they think of; this is ridiculous, I have paid for six months, and I never went to the fitness school. So they go to the fitness school and pay for another six months”

**Key Resources**

“Ze zoeken een geschikt advies op basis van jou gedrag. Ze plukken allemaal element uit op basis van adviezen die ze aan jou gegeven hebben. Die patronen houden ze bij, en dat maakt de dienst dus heel efficiënt. Op dit moment hebben ze dus een gigantische database, waardoor ze de patronen heel makkelijk kunnen matchen aan het gedrag van een cliënt, Doordat de patronen steeds fijner en gespecificeerder worden, wordt het advies steeds persoonlijker”

**Key Activities**

“So our service development went like this: First we had the internet services. Then we had the human coaching. And the third level of services is that we mate that automatic. And gradually the coaches could focus on the core benefits. And that was what I wanted them to do”

“First contact from the personal coach should be this in this timeframe, depending on if people do give an answer within a certain time, if they did not answer within a certain time, they go to a low coaching effort. If they did, then they went to an high coaching effort”

**Key Partnerships**

“Weightwatchers betaalt Philips, dus, je hebt leverancierskosten, en de kosten van de interne coaches, plus je moet af en toe ontwikkelwerk doen. En ze hebben geld nodig om de back-end vanuit de operations te doen”

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**Business model canvas supporting quotes for Citytouch**

<table>
<thead>
<tr>
<th>Business Model Canvas Block</th>
<th>Quote</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Customer Segments</strong></td>
<td>“Middle sized cities vormen onze focus. We hebben ons bewust gericht op daar waar het volume zit, want uiteindelijk zitten er meer lichtpunten in de middle sized cities dan in de grote steden wanneer je het uitrekent over de hele wereld”</td>
</tr>
<tr>
<td></td>
<td>“Middle sized cities hebben een grote behoefte aan ene partij die een lichtoplossing levert inclusief software, hosting en servicing daarvan”</td>
</tr>
<tr>
<td></td>
<td>“Hele grote steden denken vaak aan eigen IT departments. Als we ons cloud systeem moeten openen voor andere IT departments, kunnen er veel meer spelers aan en dan hebben wij de controle niet meer in de hand”</td>
</tr>
<tr>
<td><strong>Value Propositions</strong></td>
<td>“Als we dus zeggen citytouch, dan zeg je niet meer een ding. Den aam wordt nu gebruikt voor twee hoofdpunten. Je hebt citytouch remote light management, zoals het begonnen is, en je hebt citytouch asset management”</td>
</tr>
<tr>
<td></td>
<td>“Je ziet in feite een kaart met daarop al je assets geprojecteerd. En meestal zijn die connected, dus het is eigenlijk een weergave van alle assets die je nog in je excel hebt. Met allerlei datapunten. Van een lichtpunt; dus waar staat ie, hoe hoog is de paal en wat is de kleur tot hoevaak hij onderhouden is”</td>
</tr>
<tr>
<td></td>
<td>“Het CityTouch met een plug and play luminaire is een propositie waar 1 business model achter zit. Eigenlijk verkoopt je twee dingen, je verkoopt een citytouch ready luminaire, dat is een controlpoint. Vergelijkbaar met het hebben van een app store. Elke app mag maar ik ben wel baas van mijn winkel”</td>
</tr>
<tr>
<td></td>
<td>Het tweede aspect si de achterkant zelf. Dus de applicatie die de klant ziet. En dat is eigenlijk een stukje softwarebusiness dat je verkoopt, wat standalone niet zoveel waarde is zonder asset. Dus het is de combinatie, anders heb je niks”</td>
</tr>
<tr>
<td></td>
<td>“Belangrijk is dat het als een software as a service wordt weggezet. Dus niet zoals: beste klant, hier is een software beschrijving dus installeer het maar. Want dat gaat toch mis”</td>
</tr>
<tr>
<td><strong>Channels</strong></td>
<td>“In de product-business heb je grote problemen om een service te verkopen. Al onze salesteamse zijn slechts getraind in het verkopen van producten. Maar service delivery reageren ze als volgt; Wat is service? Delivery? Operations? Dat zijn toch allemaal kosten?”</td>
</tr>
<tr>
<td></td>
<td>“Onze salesman snapt het verhaal niet zo goed tussen generatie een en twee. We zijn niet zo bij machten om een goede dialoog te kunnen voeren met de klant”</td>
</tr>
</tbody>
</table>
“In feite switchen we over van onze product salesteams naar end-user salesteams. Bij product salesteams verkochten we aan installateurs, nu verkoop je aan steden. Je moet dus met de burgemeester praten en begrijpen hoe die stad werkt en wat belangrijk is. Dat is heel iets anders dan 7 luminaires verkopen”

Customer Relationships

“Customer relationships wordt long-term. Je verkoopt 10 of 20 jaar service, dat is heel anders dan shipment en het is afgelopen. Het begint echter pas bij Shipment. Dus wat we geleerd hebben, is dat we rollen citytouch alleen maar uit naar de markt als een project”

Revenu Streams

“Het product verkoop je maar 1 keer, de Saas verkoop je echter elk jaar. Dan gaan we nu snel naar de 50% toe. Dan wil je niet dat dat wordt gemiddeld. Sterker nog, die Saas verkoop je los van het luminaire in principe want dan kun je het ook met niet Philips luminaires uitvoeren”

“Daarnaast willen we in de toekomst applicaties los gaan verkopen. Plus we verkopen de controller aan third parties anders kunnen zij geen citytouch ready luminaires maken”

Dus als je een heilig geloof zou hebben dat je uit elk connected lightpoint 10, 20 of 50 euro extra kunt verdienen de komende 10 jaar; Dan is het niet heel moeilijk om nu gratis of voor de prijs van een normaal luminaire jou connected luminaire te geven”

“Het is cruciaal bij de verkoop van software dat je recurring revenu krijgt, want je hebt in elk geval recurring costs. Het inschatten van die kosten is daarnaast ook lastig, en gaat vaak fout omdat we de kennis niet hebben”

Key Resources

“Onze key resources is eigenlijk ons digitaal platform met de bijbehorende dataflows”

Key Activities

“Een belangrijke key activity is het kijken naar hoe we onze luminaires zo goedkoop mogelijk kunnen maken”

“We moeten ervoor zorgen dat alle andere luminaire makers, ook buiten Philips, ook citytouch-ready luminaires gaan maken”

Dat is eigenlijk je ecosysteem van de toekomst, dat iedereen graag citytouch ready luminaires maakt”

“Onze key activities bestaat uit veel meer aspecten namelijk; De controller in de luminaire ontwikkelen en heel de ontwikkeling aan de applicatie kan. Verder is er ook nog veel rondom marketing te doen”

“Philips heeft een duidelijke beslissing gemaakt: wij gaan niet in blue color. Dus wij gaan geen auto’s op de weg zetten met mannetjes erin die gaan serviceren.”

“We hebben ons controle systeem luminaire onafhankelijk gemaakt. Dat heet eigenlijk een beetje de OEM strategie”

Key Partnerships

“De belangrijkste key partners zijn de cloud providers, web providers, onze luminaire fabrieken, en natuurlijk onze concurrerende luminaire fabrieken”

“Dus je levert hier de luminaire aan een eindklant, maar j e levert daarnaast een controller aan een luminaire maker. Dus mensen die in de partnerschil zitten zijn voor een stukje ook weer klant. En soms kunnen ze ook nog eens tussen jou en je eindklant komen te zitten”

“managed service providers gaan kunnen ons systeem gaan gebruiken. Zij beheren contracten van 20 jaar voor een stad. Zij gebruiken die data om hun onderhoud te optimaliseren. Zij kunnen zo uiteknen wat het waard is om een luminaire te kopen die 3 tientjes duurder is in het begin; omdat die een bezoekje minder per paal heeft”

Cost Structure

“We zagen in de generatie 1 systemen dat er een grote complexiteit zat in het onderhoud, de stabilititeit, de implementatie en de installatie van het systeem”

Business model canvas supporting quotes for the Medido

<table>
<thead>
<tr>
<th>Business Model Canvas Block</th>
<th>Quote</th>
</tr>
</thead>
<tbody>
<tr>
<td>Customer Segments</td>
<td>“Het gaat vooral over mensen die thuiszowen zijn en die problemen hebben met het innemen van de medicatie op basis van geheugenverlies al dan niet dementia of andere problemen”</td>
</tr>
<tr>
<td></td>
<td>“Je hebt dus ook patienten nodig waarvan het medicijngebruik redelijk stabiel is. Er zijn dus ook patienten die elke week een andere medicijnhoeveelheid krijgen. Als je dat in de Medido stopt wordt je helemaal gek”</td>
</tr>
<tr>
<td>Channels</td>
<td>“Philips levert niet business to consumer maar van business to business. Dat betekent dat wij instellingen benaderen voor thuiszorg. End at die thuiszorg medewerkers verantwoordelijk zijn voor de selectie van welke klanten wel of niet in aanmerking”</td>
</tr>
</tbody>
</table>
komen voor een Medido. Philips levert aan zo’n instelling ook hoe je dat nou precies doet. Dat is een 81ort consultancy achtig werk’’

Customer Relationships

“Je moet gaan kijken naar hoe het process eruit ziet. Hoe moet je dat nou inrechten om dat lean en snel te doen.’’
“De Medewerker van de thuiszorg heeft contact met de klant. En de medewerker van de thuiszorg hebben meestal een medewerkend voorman of leidinggevende en die heeft tijdens de implementatie weer contactt met iemand van Philips

Revenue Streams

“Het verdienmodel van Medido is een bedrag per maand wat gedeclareerd kan worden. Daarvan krijgt de leverancier wat, Focuscura krijgt wat, en Philips krijgt er wat van’’
“Je kunt het wel over verdienmodellen gaan hebben, maar als er niemand is die wil betalen dat heeft dat geen zin. Als je bijvoorbeeld betaalt wil worden per medicijn wat eruit rolt dan loop je tegen het probleem aan dat niemand gaat betalen.’’

Key Resources

Key Activities

“De data wordt gebruikt voor de verbetering van de producten. In het begin kwamen er bijvoorbeeld wel eens valse alarmen binnen en dan bleek dat de laser van de etiquette van de rol niet goed werkte. Dit soort zaken leid je af aan de data en daarmee worden producten verbeterd’’

Key Partnerships

“In feite zijn Philips en de leverancier van de devices de key players. Andere zijn de apotheek, de zoginstelling zelf, en de verzorgers’’

Cost Structure

“De kosten zijn met name de leverancier, het vervoer van en naar de patient, storingen, installeren, onderhoud. En het ophalen van het product op het moment dat het niet meer nodig is. De medicatie moet eens in de twee weken geplaatst worden’’

Appendix IV

Description of the used business model patterns from the St. Gallen Business Model Navigator

<table>
<thead>
<tr>
<th>Pattern</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Digitization</td>
<td>This pattern relies on the ability to turn existing products or services into digital variants, and thus offer advantages of tangible products, e.g., easier and faster distribution. Ideally, the digitization of a product or service is realized without harnessing the value proposition which is offered to the customer. In other words: efficiency and multiplication by means of digitization does not reduce the perceived customer value.</td>
</tr>
<tr>
<td>Leverage Customer Data</td>
<td>New value is created by collecting customer data and preparing it in beneficial ways for internal usage or interested third-parties. Revenues are generated by either selling this data directly to others or leveraging it for own purposes, i.e. to increase the effectiveness of advertising.</td>
</tr>
<tr>
<td>Mass Customization</td>
<td>Customizing products through mass production once seemed to be an impossible endeavor. The approach of modular products and production systems has enabled the efficient individualization of products. As a consequence, individual customer needs can be met within mass production circumstances and at competitive prices.</td>
</tr>
<tr>
<td>Open Business Model</td>
<td>In open business models, collaboration with partners in the ecosystem becomes a central source of value creation. Companies pursuing an open business model actively search for novel ways of working together with suppliers, customers, or complementors to open and extend their business.</td>
</tr>
<tr>
<td>Open Source</td>
<td>In software engineering, the source code of a software product is not kept proprietary, but is freely accessible for anyone. Generally, this could be applied to any technology details of any product. Others can contribute to the product, but also use it free as a sole user. Money is typically earned with services that are complimentary to the product, such as consulting and support</td>
</tr>
<tr>
<td>Razor and Blade</td>
<td>The basic product is cheap or given away for free. The consumables that are needed to use or operate it, on the other hand, are expensive and sold at high prices.</td>
</tr>
</tbody>
</table>
The initial product’s price lowers customers’ barriers to purchase, while the subsequent recurring sales cross-finance it. Usually, these products are technologically bound to each other to further enhance this effect.

**Revenue Sharing**
Revenue sharing refers to firm’s practice of sharing revenues with their stakeholders, such as complementors or even rivals. Thus, in this business model, advantageous properties are merged to create symbiotic effects in which additional profits are shared with partners participating in the extend value creation. One party is able to obtain a share of revenue from another that benefits from increased value for its customer base.

**Integrator**
An integrator is in command of the bulk of the steps in a value-adding process. The control of all resources and capabilities in terms of value creation lies with the company. Efficiency gains, economies of scope, and lower dependencies from suppliers result in a decrease in costs and can increase the stability of value creation.

**Peer-To-Peer**
This model is based on a cooperation that specialized in mediating between individuals belonging to an homogeneous group. It is often abbreviated as P2P. The company offers a meeting point, i.e., an online database and communication service that connects these individuals (these could include offering personal objects for rent, providing certain products or services, or sharing of information and experiences.

**Subscription**
The customer pays a regular fee, typically on a monthly or annual basis, in order to gain access to a product or service. While customers mostly benefit from lower usage costs and general service availability, the company generates a more steady income stream.

**Add-On**
The core offering is priced competitively, but there are numerous extras that drive the final price up. In the end, the customer pays more than he or she initially assumed. Customers benefit from a variable offer, which they can adapt to their specific needs.

**Flat Rate**
In this model, a single fixed fee for a product or service is charged, regardless of actual usage or time restrictions on it. The user benefits from a simple cost structure while the company benefits from a constant revenue stream.

**Lock-In**
Customers are locked into a vendor’s world of products and services. Using another vendor is impossible without incurring substantial switching costs, and thus protecting the company from losing customers. This lock-in is either generated by technological mechanisms or substantial interdependencies of products or services.

**Rent Instead of Buy**
The customer does not buy a product, but instead rents it. This lowers the capital typically needed to gain access to the product. The company itself benefits from higher profits on each product, as it is paid for the duration of the rental period. Both parties benefit from higher efficiency in product utilization as time of non-usage, which unnecessarily blinds capital, is reduced on each product.

**Two-sided Market**
A two-sided market facilitates interactions between multiple interdependent groups of customers. The value of the platform increases as more groups or individual members of each group use it. The two sides frequently come from disparate groups, for example businesses on the one hand and private interest groups on the other.

**Customer Loyalty**
Customers are retained and loyalty assured by providing value over and above the actual product or service itself, for example through incentive-based programs. The goal is to enhance loyalty by creating an emotional connection or simply rewarding it with special offers. Customers are bound to the company voluntarily and this protects future revenue.
## Appendix V
### Business Model Canvas Philips Hue

<table>
<thead>
<tr>
<th>Key partners</th>
<th>Key activities</th>
<th>Value propositions</th>
<th>Customer relationships</th>
<th>Customer segments</th>
</tr>
</thead>
<tbody>
<tr>
<td>- App creators</td>
<td>- Service support to connect the bridge to the user</td>
<td>- Connected light</td>
<td>- Hue Community</td>
<td>- Self installed residential people</td>
</tr>
<tr>
<td>- Apple</td>
<td>- Innovating to get the price down</td>
<td>- Multiple Colors</td>
<td>- Hue Helpdesk</td>
<td>- Small businesses (Hotels)</td>
</tr>
<tr>
<td>- Physical stores</td>
<td>- Making other lights compatible with Hue</td>
<td>- Total control over the lights</td>
<td>- Creating awareness of new functionality and features</td>
<td></td>
</tr>
<tr>
<td>- Online stores</td>
<td>- Data analyses</td>
<td>- Integration with other services</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Web/Cloud providers</td>
<td>- Improving and maintaining Bridge software</td>
<td>- Free apps</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>- Triggering existing customers</td>
<td>- Open platform</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

| Key resources      |                                                                          | Distribution channels                               |                                     |                           |
|--------------------|                                                                          | - Philips (Online) shop                              |                                     |                           |
| - User experiences, adopted from the platform | - Sales employees                                                                 | - Physical stores                                  |                                     |                           |
|                    | - Project employees                                                        | - Online stores                                     |                                     |                           |
|                    | - IT employees                                                              | - Apple Store                                       |                                     |                           |
|                    | - material                                                                 |                                     |                                     |                           |

| Cost structure     |                                                                          | Revenue streams                                     |                                     |                           |
|--------------------|                                                                          | - Fee per Hue set                                   |                                     |                           |
| - Production costs |                                                                          | - Fee for additional hardware                       |                                     |                           |
| - Innovation costs |                                                                          |                                                     |                                     |                           |
| - Service costs    |                                                                          |                                                     |                                     |                           |
| - Marketing and distribution costs |                                                                       |                                                     |                                     |                           |
## Business Model Canvas Philips DirectLife/ActiveLink

<table>
<thead>
<tr>
<th>Key partners</th>
<th>Key activities</th>
<th>Value propositions</th>
<th>Customer relationships</th>
<th>Customer segments</th>
</tr>
</thead>
</table>
| - Weight Watchers  
- Fortune500 companies  
- Supplier device  
- Philips Research (Internal Partner)  | - Analyzing the patterns of each client  
- Combining the patterns to an (personalized) advice  
- Creating and improving the activity monitor | - Providing A healthier Lifestyle  
- *Enablers:*  
  - Activity Monitor  
  - A personal coach  
  - A platform to motivate each other  
  - Stepprove goals | - Contact between the coach, on the client  
- transferred to Weight Watchers  
- The platform | - Adults (18+) interested in a healthier lifestyle, i.e. personal diet and fitness advice  
- Companies willing to invest in the health of their employees |

<table>
<thead>
<tr>
<th>Key resources</th>
<th>Distribution channels</th>
<th></th>
<th></th>
</tr>
</thead>
</table>
| - The database with behavioral patterns, combined with the advice given by the coaches  
- Knowledge of lifestyle coaches  
- Knowledge of Diet coaches  
- Knowledge of Fitness coaches  
- IT backoffice team | - Philips Online Store  
- Fortune500 companies  
- Weight Watchers store | |

<table>
<thead>
<tr>
<th>Cost structure</th>
<th>Revenue streams</th>
</tr>
</thead>
</table>
| - Supplier costs for Activity Monitors  
- Salary 10 internal coaches  
- Costs to keep the IT system running  
- Development costs | - Single sales price activity  
- A monthly subscription fee  
- 50% of ActiveLink subscriptions from Weight Watchers |
# Business Model Canvas Philips CityTouch

## Philips CityTouch

<table>
<thead>
<tr>
<th><strong>Key partners</strong></th>
<th><strong>Key activities</strong></th>
<th><strong>Value propositions</strong></th>
<th><strong>Customer relationships</strong></th>
<th><strong>Customer segments</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>Installer</td>
<td>Providing/developing the digital platform services/applications</td>
<td>Connected outdoor Light</td>
<td>Maintenance and performance contracts</td>
<td>Municipality of semi size cities</td>
</tr>
<tr>
<td>Municipality</td>
<td>Making lights CityTouch enabled</td>
<td>Plug &amp; Play (smart Luminaires)</td>
<td>Long-term relationships by selling the system as a project including advisory and management</td>
<td></td>
</tr>
<tr>
<td>Philips Research</td>
<td>Promoting CityTouch ready luminaires to competitors</td>
<td>The digital platform (with applications)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cloud providers</td>
<td>Selling CityTouch projects to customers</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Key resources</strong></th>
<th><strong>Distribution channels</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>The digital platform database</td>
<td>End-user sales team</td>
</tr>
<tr>
<td>CityTouch project teams</td>
<td></td>
</tr>
<tr>
<td>Sales people</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Cost structure</strong></th>
<th><strong>Revenue streams</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>Costs for IT platform</td>
<td>Service Fee per year per for the digital platform use</td>
</tr>
<tr>
<td>Salaries project teams/sales force</td>
<td>Single fee for the smart luminaire</td>
</tr>
<tr>
<td>Hardware (innovation) costs</td>
<td>Single Fee for selling the OLC (Outdoor Lighting controller) to third-party developers</td>
</tr>
</tbody>
</table>
### Business Model Canvas Philips Medido

<table>
<thead>
<tr>
<th>Key partners</th>
<th>Key activities</th>
<th>Value propositions</th>
<th>Customer relationships</th>
<th>Customer segments</th>
</tr>
</thead>
<tbody>
<tr>
<td>- Home Care Institutes</td>
<td>- Providing service support</td>
<td>- A signal when to take a drug</td>
<td>- Philips Medido Helpdesk</td>
<td>- Home living elderly with the disability to take the right drugs on the right time</td>
</tr>
<tr>
<td>- NZa</td>
<td>- BJ8 marketing</td>
<td>- The right drug rolls automatically out of the device</td>
<td>- Via Pharmacist</td>
<td></td>
</tr>
<tr>
<td>- Health Insurance</td>
<td></td>
<td>- Provides a signal if medication is not taken</td>
<td>- Via Home Care Institute employers</td>
<td></td>
</tr>
<tr>
<td>- Pharmacist</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Care (Alarm) Center</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Doctor</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Key resources</td>
<td>Key resources</td>
<td>Distribution channels</td>
<td>Distribution channels</td>
<td></td>
</tr>
<tr>
<td>- Medido salespeople</td>
<td>- Medido salespeople</td>
<td>- Home Care Institutes</td>
<td>- Home Care Institutes</td>
<td></td>
</tr>
<tr>
<td>- Product developers</td>
<td>- Product developers</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Cost structure

- Supplier costs
- Distribution costs
- Maintenance costs
- Replacing medication costs

### Revenue streams

- Monthly fee per installed device
Appendix VI

Complete Business ecosystem Hue

The business ecosystem of the Philips Hue where Apple was the only channel is visualized in figure 1. As explained in section 4.1.1, Philips started selling the Hue via an exclusive channel which was Apple. At that time, the app was only available in the Apple App store for Apple devices.

After 6 months, the Hue received a lot of attention from early adopters, and from other stores (online and physical) who wanted to have the Hue products in their stores. Philips started to sell the Hue in all the stores and give app creators the free possibility to create apps for the Hue and for all the mobile devices. This was all to let the installed base of the Hue platform grow as good as possible. Furthermore, they created a platform where early adopters can share their experiences with the Hue, and where Philips Hue can learn from its early adopters.

The final ecosystem after these changes is visualized in figure 2.
Complete business ecosystem directlife

Complete business ecosystem Activelink
Complete Business ecosystem CityTouch

Complete Business Ecosystem Medido
 Appendix VII
Navigation slide, business model innovation tool

Business Model Innovation tool

USE PRESENTATION MODUS

Click on the red button to navigate directly to the four core dimensions of the Business Model and the 55 Business Model tools

Click on the Blue button to navigate directly to the internal and external case examples

Click on the Orange button to navigate directly to the ‘Open versus closed’ platform learnings and results from a BM perspective

PHILIPS