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SCHOOL OF BUSINESS, ECONOMICS AND LAW

Generating Value from IoT Through International Business Models

A Multi-Case Study on Multinational Corporations

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Abstract

Current events and future trends point towards the importance of Internet of Things (IoT) and companies needing to implement changes to their business models in order to capitalize and generate the potential value that IoT can emit. Even though these future trends have been highlighted by multiple sources there are currently a lack of empirical supported research that studies IoT from a business perspective and investigates how to incorporate it into an international business model, as well as the challenges of creating and capturing the value generated from it, especially in the international business context. To address this research gap a multi-case study was carried out on six companies from various industries. The authors utilized the business model canvas (BMC) as a main framework when carrying out interviews and have refined the framework into an international IoT BMC. Through the multiple-case study it was revealed that the companies had implemented multiple adaptations to their BMC building blocks in order to generate value through IoT. The most important adaptations made were to Customer Relationship, Revenue Streams, and the three Value Creation block. An IoT ecosystem was also considered an important aspect for firms in the value creation process, where the company's role within the ecosystem can vary from having a central part to focusing on a more niche role. Finally, it was found that IoT has an effect on firms international business model and leads to an increased standardization of the company's international operations.

Key words: Business Models, Business Model Canvas, BM, BMC, International Business, International Business Models, Internet of Things, IoT, Value Creation.

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Abbreviations

B2B – Business-to-business

B2C – Business-to-customer

B2G – Business-to-government

BM – Business model

BMC – Business model canvas

EV- Electric vehicle

IMO - International Maritime Organization

IoT – Internet of things

IT – Information technology

MNC – Multinational Corporation

NEVS – National Electric Vehicle Sweden AB

OEM - Original equipment manufacturer

R&D – Research and development

SaaS – Software as a service

SME – Small-medium enterprise

QR - Qualitative research

1. Introduction

This portion of the paper serves as the introduction chapter and presents the reader with a brief background and problems regarding IoT and BMs. Furthermore, the purpose, research question, and delimitations of the thesis are set forth.

1.1 Background

When reading about current events and future trends throughout the globe there are two topics that are continually repeated in magazines and global reports, companies spending capital to expand their international presence and the Internet of Things (Economist, 2019a; Economist, 2019b; Economist, 2019c; Marr, 2018; Weil, 2016; UNCTAD, 2019).

Internet of Things (IoT) should be considered the next evolutionary chapter of the world of Internet and can be recognized as one of the most powerful and crucial creations in human history (Manyika et al., 2017). However, the idea of IoT - where an intricate network of objects, places, and environment becomes connected with one and another through the medium of the Internet, is not (Robertson et al., 2013). Instead it is a relatively old concept that has been envisioned since the 20th century by several technologists, inventors, and futurists (Xiangxuan, 2017). Even though the idea of a connected world is old, it was not until the 21st century that IoT was finally able to be implemented into daily life (Ashton, 2009). Due to these innovative projects that will connect devices that are used on a daily basis mankind will be able to become more proactive rather than reactive (Manyika et al., 2017). As this will not only allow people's lives to become more simplified and automated (Economist, 2019c), but will also enable us to process data like never before (Manyika et al., 2017). A large reason as to why one will see such a shift in society's ability to be more proactive is due to the fact that IoT will be able to sense, collect, transmit, analyze, and distribute the data on such a massive and efficient scale (Evans, 2011). Considering the great benefits that IoT is supposed to bring to the world by allowing society to take this large step towards gathering, analyzing, and distributing data that can be turned into information, knowledge and wisdom (Ibid.). It is not simple for firms to try to capture the benefits of IoT, as they will be required to enact certain conditions that will allow them to overcome technical, organizational, and regulatory hurdles (Manyika et al., 2017). Additionally, as IoT is a rather dynamic industry where the technology is constantly evolving, firms are required to develop and implement new business

models (BM) that will help them to truly create, capture, and deliver the value that IoT produces (Evans, 2011; Manyika et al., 2017; Westerlund et al., 2014; Krotov, 2017)

A BM is seen as crucial for most firms and can be viewed as a structural template of how firms are run on a holistic and system level (Clauss, 2017). The concept of BMs has become a well-used concept for professionals and academics since the 1990's; however, the definition of a BM has not been clearly defined and agreed upon (DaSilva & Trkman, 2012). The common conception of BMs is that it refers to how a company creates value (Child et al., 2017). The creation of a BM is an essential foundation for all companies, where a multinational corporation (MNC) is no exception and the different geographical presence of MNCs adds further complexity in the creation of BM (Tallman, 2014).

Today MNCs are seen as an existential driver of the global economy as they initiate the flow of goods, capital, and development of countries throughout the globe. Even though the idea of being a company with an international presence in multiple nations can be classified as an "old" idea, the ability of becoming a MNC has never been more viable today as government policies, technologies, capital markets, and international networks have changed to enable firms that was previously only domestic firms to transform into MNCs (Aharoni & Ramamurti, 2008). To successfully capture these possibilities MNCs need to find a balance between responding quickly to local markets (Rašković et al., 2013) and centralizing functions to provide a standardized global strategy within the MNC (Tallman, 2014; Rask, 2014).

1.2 Problem Discussion

Taking into consideration the fast pace of the trends within BM, international business, and IoT within the business world, it is not surprising that the academic world has had trouble keeping up with all of them (DaSilva & Trkman, 2012, Westerlund et al., 2014; Klein et al., 2017; Leminen et al., 2011; Turber et al., 2014). Even though the implementation of IoT is a relatively new concept (Evans, 2011), there has already been a wide range of studies conducted on the subject matter. Nonetheless, when analyzing what these studies have examined it becomes apparent that majority of the literature is more fixed on the technical capabilities and challenges of IoT (Leminen et al., 2011; Díaz-Díaz et al., 2017; Klein et al., 2017), rather than analyzing IoT from a business perspective such as, how to incorporate IoT into a BM, or the challenges of monetizing or creating and capturing the value generated from

IoT (Westerlund et al., 2014; Klein et al., 2017; Turber et al., 2014). Nevertheless, there have been some articles that do study IoT from a business perspective, however most of these articles' conclusions are not based on empirical findings (Bilgeri and Wortmann, 2017). This is demonstrated by the studies conducted by Chan (2015), Westerlund et al. (2014), and Turber et al. (2014), which are more in the vicinity of only proposing potential BM frameworks that firms should implement to be able to accommodate for IoT. While studies by Dijkman et al. (2015) and Metallo et al. (2018) have investigated and found some empirical evidence regarding IoT BMs, there is a need for further research on how companies generate value through IoT.

To be successful within their line of business most firms develop a BM in order to create and capture value within their internal and external operations. An internally consistent, well-defined BM that is in line with the business market environment is said to be essential for firms in order to gain a competitive advantage (Tallman, 2014). The concepts of BMs have been implemented to a large extent by academics and practitioners over the last decades and many different definitions of the concept have been proposed (Child et al., 2017). While the creation of value stands as the main focus of a BM, existing research incorporate different aspects of the business into their definition of a BM (DaSilva & Trkman, 2012). This has led to the creation of different BM design tools as well as different definitions of what a BM is (Dijkman et al., 2015; Rask, 2014). The lack of a unified definition of BM within literature indicates that there are different approaches to take when conducting a BM, depending on the company and the environment in which it operates (Child et al., 2017, Tallman, 2014).

According to Osterwalder & Pigeur (2010) companies need to constantly update its BM to retain its competitive advantage. The increasing dynamics and changes of the environment in which companies operates has led to companies revising their BM more frequently; resulting in upgrades of the BM on average every five years (Osterwalder & Pigneur, 2010). BM innovation is an important aspect of how companies can capture the possible value of new technology. According to Chesbrough (2010) *"It is probably true that a mediocre technology pursued within a great business model may be more valuable than a great technology exploited via a mediocre business model."* Without successfully innovating the BM, firms will not be able to generate the full possible value from new technology such as IoT.

The dynamic nature of MNCs add additional complexity to the creation of their BM as a wide variety of factors influence it, making it difficult to have one single model working effectively

across the whole organization (Tallman, 2014) as well as the existence of barriers for MNCs when creating a BM to capture the value of IoT (Bilgeri and Wortmann, 2017). Due to this, international BMs tend to be overlooked by the academic society when studies relating to BM theory are conducted. This has led to research gaps that needs to be filled relating to the implementation or adaptation of MNCs international BMs (Cao et al., 2018).

New IoT driven market environments creates a need for corporations to rethink their firm-centered BM as new cross industry IoT ecosystem arises (Turber et al., 2014). Creating new BMs that can capture and generate value through IoT will be essential for many firms, as the old BMs will not be equipped to grasp the opportunities and the potential financial returns arising from IoT (Dijkman et al., 2015). Furthermore, with the emerging trends of IoT and increased worldwide presence of MNCs, companies will need to be able to adapt to these changing environments and create BMs that accommodate for these future needs. Considering the complexities of creating BMs for IoT and MNCs, as well as the lack of studies that consider the combination of these topics, research gaps are revealed among current literature.

1.3 Purpose

Taking into consideration the problems and research gaps that were highlighted within international BM literature and IoT studies, the purpose of this study is to provide the reader with increased knowledge of international BM and IoT and display empirical evidence of what adaptations multinational corporations perform to their BM to generate the full potential value of IoT.

1.4 Research Question

What adaptations do MNCs implement to their international business model in order to generate value through IoT?

1.5 Delimitations

Throughout this thesis the authors will focus the study on MNCs originating from Sweden as the authors are located in Sweden, resulting in a belief of it being easier to contact and persuade Swedish MNCs to partake in the study, as well as the potential financial costs of including MNCs originating from other countries. The authors will also have a strong focus

on just BMs, and they wish to emphasize that a BM describes the foundation of how companies creates, captures, and delivers value (Child et al., 2017, Clauss, 2017, Demil et al., 2015, Osterwalder & Pigneur, 2010). The term BM has frequently been confused with other management terms such as strategy, business concept, and economic model (DaSilva & Trkman, 2012). While these activities play a vital role within a company, they will not be the focus of this thesis.

Furthermore, since the aim of IoT can become very broad (Robertson et al., 2013). It becomes important that when studying IoT, one sets up limitations of what exactly will be studied. In this thesis due to time constraints, as well as the primary focus of the thesis being on effects of BMs, this thesis will omit Industrial IoT.

2. Theoretical framework

This chapter of the thesis aims to provide the reader with an overview of IoT and BM literature, as well as previous research that has been conducted regarding the two topics. Furthermore, the theories and framework presented and discussed in this chapter will be utilized as a base for analysis in chapter 5.

2.1 The Internet of Things

It is commonly argued that the idea of IoT has its roots in the 20th century (Atzori et al., 2017). It was not until 1999 the term "*Internet of Things"* was created by Kevin Ashton and the theory was finally implemented into practice during a presentation to Procter & Gamble (Xiangxuan, 2017; Atzori et al., 2017; Ashton, 2009). Since this revolutionary presentation of how a company could link their supply chain to the Internet by enabling computers to observe, recognize, and comprehend the world without the need of humans entering the needed data (Ashton, 2009), the concept of IoT has undergone transformations and further evolved. Atzori et al. (2017) conducted an analysis to identify the technologies that have contributed to the birth and development of IoT in order to understand the evolution of it. In the study it was unveiled that IoT has already gone through two generational stages and has now entered its third stage: *"Age of Social Objects, Cloud Computing, and Future Internet"*. Additionally, as the roles of new technologies, architectures, and standards were investigated, 11 essential technological fields were identified as the main drivers that enabled the transitions from one generation to the next and can be seen summarized in Appendix A. After reading Atzori et al. (2017) study, it becomes evident that IoT cannot be classified as a single technology, instead it should be seen as a network of integrated technologies that will most likely continue to develop in the future as new technologies, standards and visions will emerge that will build on its current capabilities (Xiangxuan, 2017).

An exact and precise definition of IoT does not exist. Instead the definition changes quiet often depending on who says it and their perspective (Xiangxuan, 2017). A great example is when comparing OECD (2016) definition of IoT -

"*An ecosystem in which applications and services are driven by data collected from devices that sense and interface with the physical world. Important IoT application domains*

span almost all major economic sectors: health, education, agriculture, transportation, manufacturing, electric grids, and many more."

with the definition that IBM uses,

"The Internet of Things refers to the growing range of connected devices that send data across the Internet." (IBM, 2020)

It is illustrated how diverse and integrated the definitions of IoT can be from one party to the next. However, for this thesis the general definition used was *"Things/devices from the physical world that are connected to the Internet/network, where information is communicated to enable services."* (Xiangxuan, 2017). This definition was used in order to simplify the understanding of IoT and was identified by Xiangxuan (2017) after a text analysis on 60 different definitions.

To be able to fully understand IoT and the changes that it will bring to both society (Evans, 2011) and the BMs of firms (Westerlund et al., 2014), it is important to have an understanding of the general setup of an IoT platform. Porter & Heppelmann (2014) have created a model they term technology stack; in this model a connected product needs a combination of hardware and software components in a multilayered stack of IoT technologies to become fully implemented into the IoT platform. The model consists of a three-layer stack of IoT technology: the device layer, the connectivity layer, and an IoT cloud layer. On the device layer the physical object gains additional IoT specific hardware such as actuators and sensors as well as embedded software, which can be modified to manage and operate the functions of the physical object. The connectivity level enables the communication of the physical thing in layer one with the IoT cloud layer. Within the IoT cloud layer there are a range of different functions built up to capture the information from the connected objects. Different software within the IoT cloud handles the captured data generated by the physical items, through the captured data the software are able to help monitor and execute processes involving the connected people, systems, and things by actively communicating instructions back to the linked object (Porter & Heppelmann, 2014). Since IoT platforms are software that can be used for a wide range of purposes and by different products, they are constantly modified to fit the needs of a company and the products using the platform. This leads to adaptations of the

three-layer structure in different organizations, depending on their product (Wortmann & Flüchter, 2015).

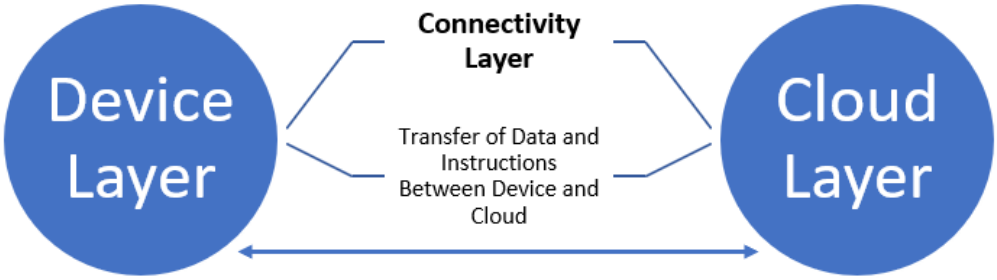

Figure 1: Three-layer technology stack (Authors adaptation based on Porter & Heppelmann, 2014)

Value creation is at the core of IoT as innovation characterized by a combination of physical and digital products lead to the creation of new products and BMs. Companies can typically combine a physical device with either a hardware or software IT solution to enable additional digital services. The device that has primarily produced a physical function, which had only been able to be utilized on a local level, can now be used on a global level due to these additional services (Wortmann & Flüchter, 2015). Furthermore, the value generated through IoT is not limited to the individual product. The value may be further enhanced if the product becomes connected to related products as a part of a product network. Additionally, the created product network can be connected to what has been previously considered a separated system in order to create further value (Porter & Heppelmann, 2014).

2.2 Business Models

Within the BM literature there is a lack of a consistent conceptualization of BMs, which has resulted in a wide range of explanations of what components constitutes a BM design. Nevertheless, within the research community there is a strong consensus that there are two dimensions that make up the main components of a BM, namely value creation and capture. (Baden-Fuller & Haefliger, 2013, Child et al., 2017, Clauss, 2017, Demil et al., 2015). Furthermore, literature argues for a third main component of a BM to have an important role such as value delivery - how the value created within the company is delivered to its customers (Baden-Fuller & Haefliger 2013, Teece, 2010). Clauss (2017) further develops the reasoning around value delivery and argues for the dimension of value proposition, which refers to a firm's value offering and how it is delivered to the customers. Clauss (2017)

concludes that there should be three main dimensions of a BM which can be described as *value creation*, *value capture* and *value proposition*.

To be able to fully grasp the three dimensions there is a need to break them down further. Clauss (2017) performs a comprehensive review of BM literature and identifies sub constructs that are seen as important within the three main dimensions of the BM design. Within the *value creation* dimension the sub constructs are new capabilities, new technology, new partnerships and new processes. The *value proposition* involves new offerings, new customers and markets, new channels, and new customer relationships. Finally, the *value capture* dimension consists of new revenue models and cost structures. The BM framework developed by Clauss (2017) is similar to the business model canvas (BMC) developed by Osterwalder & Pigneur (2010), which consists of 9 building blocks. The 9 building blocks within the BMC are: (1) customer segments, (2) customer relationship, (3) channels, (4) revenue stream, (5) cost structure, (6) key activities, (7) key resources, (8) key partners, and (9) value proposition, (Ibid.). The frameworks developed by Clauss (2017) and the BMC share many similarities in its structures, however, in this thesis it has been decided to proceed with the BMC as the main BM framework, due to previous utilization of the BMC when studying IoT and BM (Dijkman et al., 2015, Klein et al., 2017, Metallo et al., 2018) as well as the framework itself being based on a meta-analysis of 470 practitioners (Osterwalder & Pigneur, 2010).

2.2.1 Business Model Canvas

The BMC will be used as the main structural BM framework on which the theoretical framework, data collection, and analysis will be built upon. The framework will enable the reader to gain a better understanding of how IoT applications within different firms can affect the different blocks that constitutes the BMC. The BMC should be seen as a tool for continuous refinement of the BM in the business planning process as well as a starting point that could be modified or refined depending on aspects such as business context and technological development (Borseman et al., 2016) Furthermore, the creation of the BMC has also assisted the development of modified BMC's such as; Lean BMC, Advanced BMC, and the Value Model Canvas (Hong & Fauvel, 2013). To provide a more structural overview of the BMC the authors have grouped the nine building blocks of the BMC into 4 categories named Customer Blocks, Financial Flows, Value Creation and Value Proposition that will be utilized throughout the thesis.

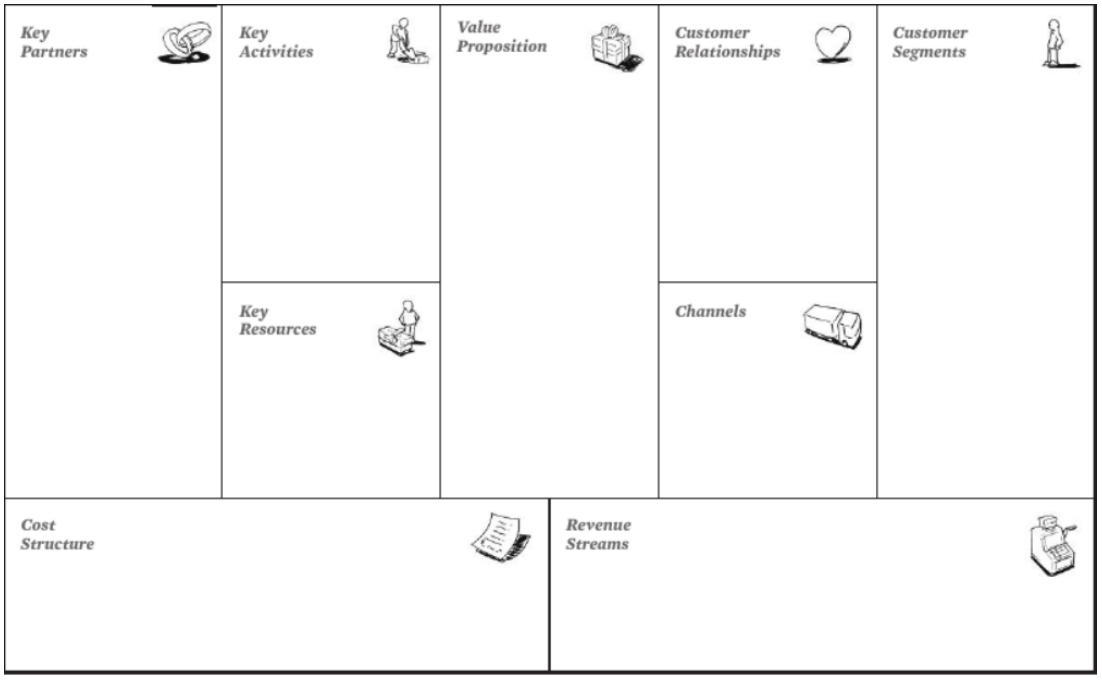

Figure 2: The Business Model Canvas (Osterwalder & Pigneur, 2010).

2.2.1.1 Customer Blocks

Customer segments

Customer segments play a key role for any business as it defines the groups of different people or organizations in which a company aims to provide goods or services to (Afuah, 2014). The group of people and organizations are categorized into different segments according to shared needs, behavior or other. Once the company has decided which customer segments to focus on and which to ignore, a BM can be designed around a deep understanding of the specific needs of the customer (Osterwalder & Pigneur, 2010).

Customer Relationships

Customer relationship refers to the different types of relationships, which are built between the company at hand and the targeted customer segment. It is essential for a company to maintain a strong relationship as customers provide information about environmental changes and market needs (Clauss, 2017). Due to this it is important to also clearly display what type of relationship a firm intends to establish with a customer segment, as the relationship can look different depending on the company and the customer segment at hand and range from personal to automated. Customer relationships are mainly driven by a need for customer

acquisition, customer retention, and boosting sales within a company (Osterwalder & Pigneur, 2010).

Channels

Channels describe the process behind how a company delivers its value proposition to its customer segments (Baden-Fuller & Mangematin, 2013). The channels block of the BMC serves five main functions. Firstly, it raises awareness about the company's products and services amongst customers. Secondly, it serves customers in evaluating the value proposition. Thirdly, makes the products and services offered by the company available to be purchased by customers. Fourthly, delivers the value proposition to customers. Finally, channels serve the purpose of providing after sales support to the company's customers (Osterwalder & Pigneur, 2010).

2.2.2.2 Financial Flows

Revenue Stream

The revenue stream building block displays the cash earned by a company from each of its customer segments (Osterwalder & Pigneur, 2010). It is important for a company to determine how much a customer segment is willing to pay for the value proposition being offered by a company (Zott & Amit, 2010). The revenue stream from different customer segments can come through a range of different pricing mechanisms such as; the sale of an asset, usage fees, subscription fees, lending and licensing (Osterwalder & Pigneur, 2010).

Cost Structure

The cost structure building block display the types of cost associated with operating the BM (Johnson et al., 2008). The importance of cost structure can vary between different firms depending on how the BM looks like (Clauss, 2017). Cost driven BMs put a strong emphasis on minimizing cost wherever possible, while value driven BMs are less concerned with the cost aspect and focuses more on the value creation of the BM. Cost structures can take the form of the following characteristics: Fixed costs, variable costs, economics of scale and economies of scope (Osterwalder & Pigneur, 2010).

2.2.2.3 Value Creation

Key activities

The key activity building block describes what activities are required for the company in order to realize its BM. Key activities are essential in order to create and deliver a value to the company's customer segments and what type of activities which are required depends on the company's industry and BM (Osterwalder & Pigneur, 2010; Zott & Amit, 2010).

Key Resources

The key resource building block of the BMC refers to the most essential assets within a firm, which enables the BM to work successfully. The key resources allow the company to create a value proposition, reach markets, develop relationships with customer segments, and eventually earn revenue and sustainable competitiveness (Osterwalder & Pigneur, 2010; Barney, 1991). Key resources can be in the form of physical, intellectual, human and financial. Furthermore, key resources can also be owned or leased as well as acquired from one of the firm's key partners (Osterwalder & Pigneur, 2010).

Key Partnerships

Key partnerships refer to the network of suppliers and partners, which enable the BM to work successfully. Building strong relationships with other organizations has become more and more important for many businesses and is an essential part of value creation (Zott et al., 2011; Osterwalder & Pigneur, 2010). Partnerships such as strategic alliances has allowed firms to optimize their BM and there are three main reasons to enter into a partnership: (1) optimization and economy of scale, (2) minimization of risks and uncertainties, (3) acquisition of essential resources and activities (Osterwalder & Pigneur, 2010).

2.2.2.4 Value Proposition

Value proposition within a firm consists of a bundle of goods and services that will create value for a targeted customer segment (Teece, 2010). The value proposition stands as the reason for why one customer turns to a specific company as it solves a problem or satisfies a need inhabited by a customer (Clauss, 2017). A combination of qualitative and quantitative elements for the value proposition includes newness, performance, customization, cost reduction, accessibility and price amongst others (Osterwalder & Pigneur, 2010).

2.3 IoT within Business Models

Creating a BM for the IoT based product and service is considered to be highly complex, but it is necessary for firms to change their BM in order to generate the full value of IoT (Klein et al., 2017). Within the BMC, the most important aspect for a company in order to generate value from IoT is the value proposition building block. IoT enables businesses to find new ways of creating, capturing and delivering value through customized value propositions as well as smart products and services (Metallo et al. 2018). In addition to the value proposition, key activities and key resources are considered important within an IoT BMC (Dijkman et al., 2015; Metallo et al. 2018). Dijkman et al. (2015) and Metallo et al. (2018) breaks down the BMC further and looks into more specific activities and aspects of the nine different building blocks which is considered important for an IoT BM. Figure 3 is an adaptation of the results from the two articles and illustrates potentially important aspects of an IoT BMC, where ** indicates that the aspect was found important in both articles, while * means that one of the articles found it important, and the grayed aspect was not found important in either of the two articles.

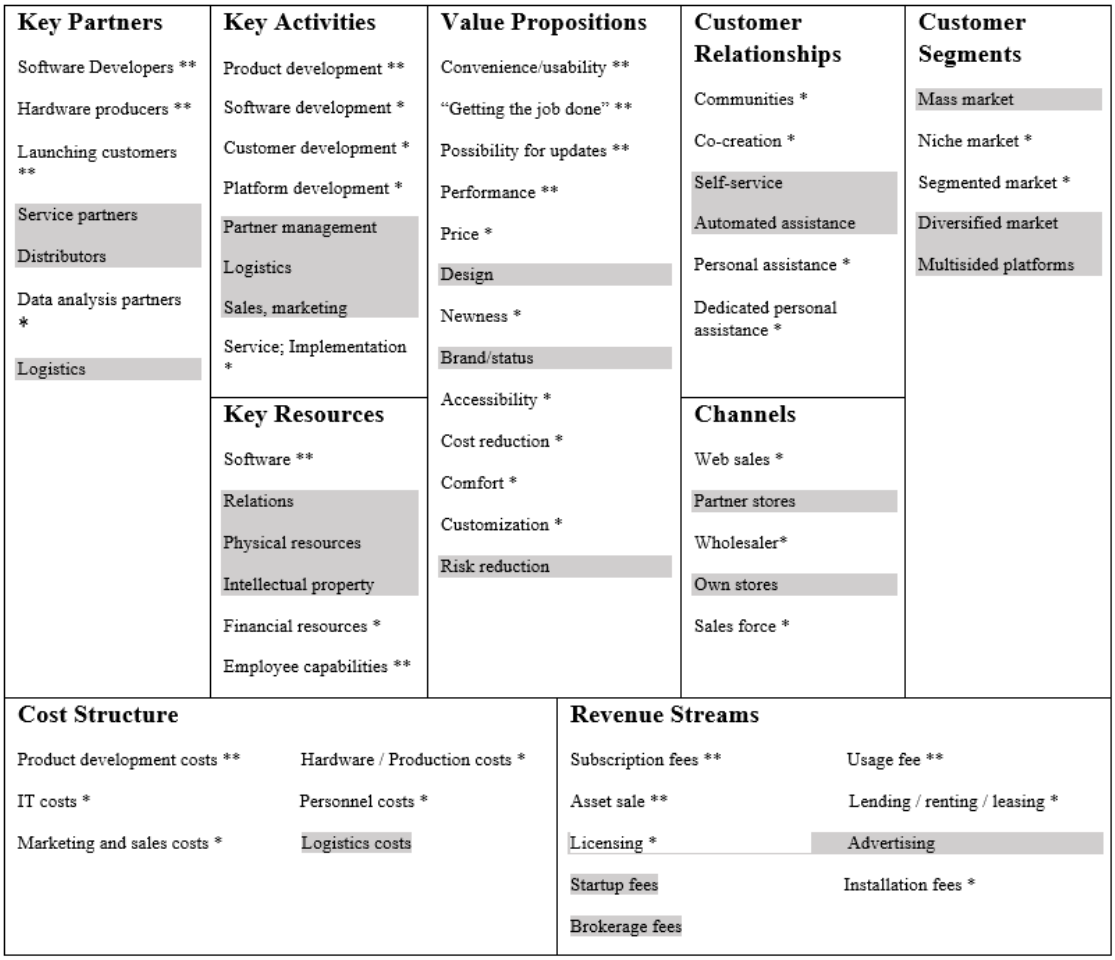

Figure 3: BMC of an IoT firm (Adaptation by authors based on Dijkman et al., 2015; Metallo et al., 2018)

The BMC has a strong focus on the company at hand and what the firm can do internally to create, capture and deliver value in general and through IoT. However, studies indicate that to fully generate value from IoT, there could be a need for firms to consider an IoT ecosystem (Klein et al., 2017). Westerlund et al. (2014) argue that the traditional BM designs are sufficient enough when assessing the challenges that a single company could face. However, within the context of an IoT ecosystem, established BM frameworks are not suited or accommodated for it, nor the challenges that can emerge in it. Since these BM frameworks are unable to help firms; analyze the growth and success of their competitors within the same ecosystem, identify the horizontal needs and opportunities that will emerge, or efficiently align internal teams within the company to accommodate for market maturity problems. Westerlund et al. (2014) lobbies the idea of connecting different parts of the BMC and create

a focus on the flows and actions of different portions within a BM, rather than just displaying single parts of a BM.

The IoT ecosystem BM has the goal of connecting the external environment that firm operates in with the BM design that supports value creation and capture (Metallo et al., 2018). In order to do this Westerlund et al. (2014) suggests replacing the term business model with value design as a value design is more suitable for an ecosystem, and identifying four pillars rather than nine; *value drivers*, *value nodes*, *value exchange*, and *value extract* as these value pillars are deemed more appropriate when designing a BM that incorporates an IoT ecosystem (Figure 4).

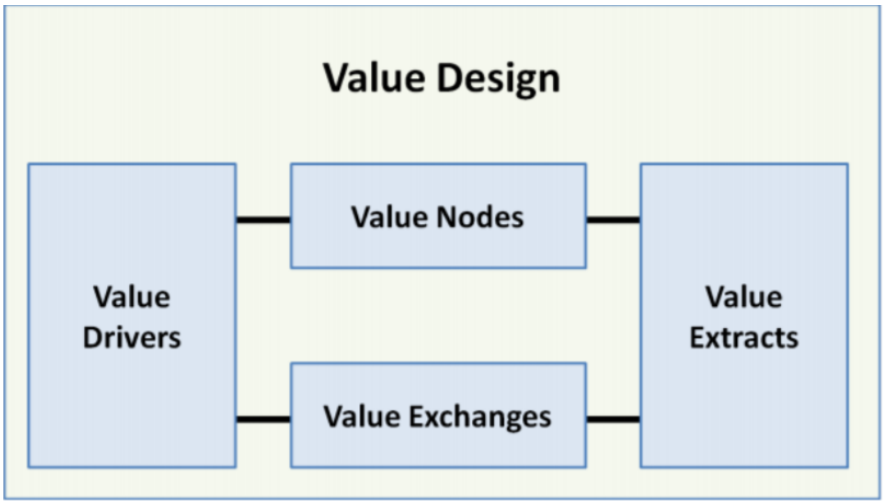

Figure 4: The Four Value Pillars (Source: Westerlund et al., 2014)

2.4 International Business Model

Traditionally, the concept of BM assumes that the environment the BM is implemented in is a stable and constant domestic environment, which allows a BM to operate in an efficient manner (Tallman, 2014). As international BMs are required to operate the same way, this assumption is not supportable in an international environment as this setting is far more complex and dynamic compared to any domestic environment, as no nations market is identical to another (Tallman, 2014; Rask, 2014). Due to this companies are required to adapt to the market conditions of said country that they aim to penetrate (Ibid.). As these organizations will be faced with a wide range of circumstances their BMs must be flexible and able to accommodate for local market conditions and needs, as well as the different

national systems that are evolving and changing over time (Tallman, 2014). On top of needing to possess this flexible trait to accommodate each individual nation's market, international BMs are also obligated by their company's global strategies to be able to integrate with other regional or worldwide BMs, meaning international BMs must be standardized is some way (Tallman, 2014; Rask, 2014). Due to these two varying conditions, international BMs become complex and overlooked in BM literature (Rask, 2014; Tallman, 2014; Cao et al., 2018).

Even though studies pertaining to international BMs tend to be overlooked, there is some research on the topic (Cao et al., 2018). Rask (2014) set out to identify different typologies of international BMs, as it was believed that international BMs have distinctive designs depending on the location of the firm's activities and the entry mode choice into a market. By utilizing the theory of BMC, Rask (2014) identified four different international BMs (Figure 5); (1) *Domestic-Based Business Model,* which are implemented by firms who take a standardized strategic approach and locate most of their upstream and downstream activities domestically, yet tend to utilize domestic firms such as export houses or similar indirect sales channels to ensure that their products or services are sold internationally (Ibid.). (2) *Export-Based Business Model,* employed by firms that locate their production activities domestically, and seek sales opportunities in other international markets to export their products and services to in hopes of earning a higher profit than by selling in their home country (Ibid.). (3) *Import-Based Business Model*, inverse of the export-based BM and focuses on sales opportunities in the domestic markets while relying on global supply markets to source production through import, contract manufacturing/outsourcing, and foreign located production subsidiaries (Ibid.). (4) *Semi-Global Business Model* incorporates the characteristics of both export and import based BMs and relies on the globalization of markets and production by locating a firm's activities where the best cost/value ratio is found (Ibid.). Furthermore, Rask (2014) also examined the challenge of how standardized an international BM should be across several countries, versus the level of flexibility that should be allocated to an international BM in order for it to respond to local differences in an effective way. Rask (2014) identified 4 separate strategies that should be implemented to the presented international BMs in order to handle these challenges in various ways. The strategies identified were *standardization*, using the same BM on a global scale to achieve efficient economies of scale /scope across different borders; *adaptation*, reflects the need for BMs to be responsive to local conditions in terms of customers, relationships and channels to enable the highest possible revenue; *specialization*, strategy designed to exploit the differences in

upstream and downstream activities by selecting partners with low-cost activity resources in order to reduce costs; and *coordination* which helps capture opportunities by combining and integrating new value chain activities in order to increase profits on a continual basis.

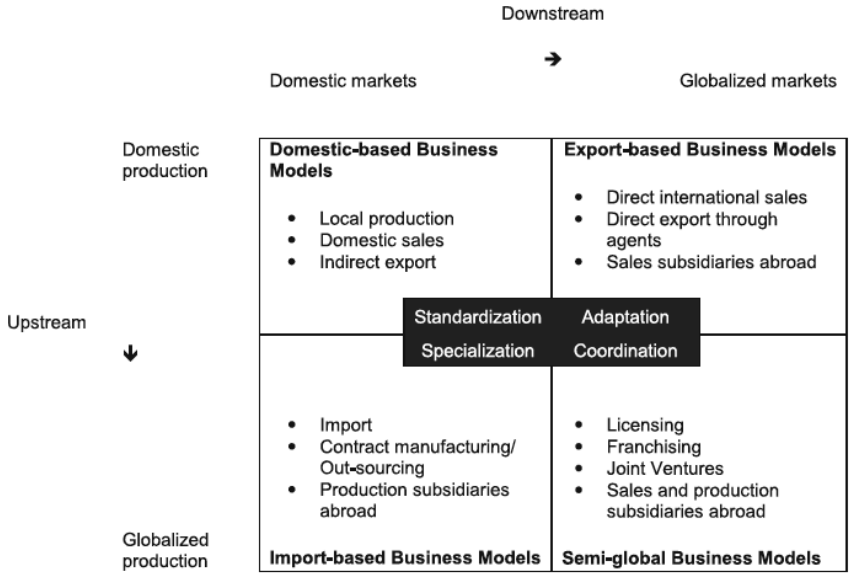

Figure 5: International BM typologies and strategies (Source: Rask, 2014)

Child et al. (2017) conducted a similar study that focused on international small-medium enterprises (SMEs) and discovered that SMEs can also be grouped into different typologies. Further strengthening Rask (2014) belief that international BMs have distinctive designs depending on various factors. However, Child et al. (2017) uncovered that the typologies that Rask (2014) had created was not applicable to SMEs international BMs. Instead SMEs adopted different designs such as: traditional-market adaptive, technology-exploiter, or ambidextrous explorer, due to the industry or the economic development of their home country (Child et al., 2017). SMEs that are more likely to adapt the *traditional-market adaptive* BM are located within industries where their products have short life cycles and innovation does not play an important role. Instead, the link and relationship that the SME has with both customers and suppliers are prioritized, as without these a firm would not be able to quickly adapt and deliver a proper product to the targeted market (Ibid.). On the other hand, firms in industries that allows for a longer product life cycle that is driven by a SMEs ability to identify new technical possibilities with existing offerings to meet market needs, would adopt a *technology-exploiter* BM design (Ibid.). Lastly, firms in industries that allows time for both the development of current products and new offerings will adopt the *ambidextrous explorer* BM (Ibid.).

2.5 Summary of Theoretical Framework

To summarize this chapter the authors has created Table 1 to display the key findings that they made throughout the theoretical framework. Table 1 provides the structure of the authors self-created International-IoT adapted BMC, which was named InoT BMC. This InoT BMC will be utilized further on to display and provide an analysis of the empirical findings and finally revised in Part 6 of the thesis. Within BM literature there is a lack of a consistent conceptualization of BMs, which has resulted in a wide range of explanations of what components constitutes a BM design. Nevertheless, within the research community there is a somewhat consensus that there are three dimensions that make up the main components of a BM, *value creation*, *value capture* and *value proposition* (Baden-Fuller & Haefliger, 2013, Child et al., 2017, Clauss, 2017, Demil et al., 2015). Through a meta-analysis a BM refinement tool that incorporates the three main components was developed, which is known as the BMC (Osterwalder & Pigneur, 2010). The BMC enables firms to understand how they are able to create, capture, and deliver value to their customers (Ibid.). The high complexity of IoT has made it difficult for companies to create BMs that truly generate value from IoT (Klein et al., 2017; Atzori et al., 2017), however, it is argued that the BMC can assist firms in designing a BM that do accommodate for IoT (Klein et al., 2017). Dijkman et al. (2015) and Metallo et al. (2018) breaks down the BMC further and highlights specific activities and aspects of the nine different building blocks which are considered important for an IoT BM. On the other hand, some authors such as Westerlund et al. (2014) argues that the traditional BM designs are not sufficient enough to fully capture the value of IoT, as they do not consider the IoT ecosystem. Instead Westerlund et al. (2014) suggests the idea of connecting different parts of the BMC and focus on the flows and actions of different portions within a BM. In addition to how to create a BM and efficiently implementing IoT into it, MNC´s face further complexities when the BMs needs to be implemented on an international basis. The BMs used in an international context require in most cases to be adapted to local market needs in order to perform successfully (Tallman, 2014). Further complexity is added in the creation of an international BM, as there are additional needs for standardization as the BM is obligated by the company's global strategies to be able to integrate with other regional or worldwide BMs (Tallman, 2014; Rask, 2014). Rask (2014) identifies four different typologies of international BM depending on the upstream and downstream activities of the firm, which results in a need for specific strategies in the allocation of resources and adaptation vs. standardization of the BM.

Table 1: Summary of Theoretical Framework (adopted by authors)

	BMC Building Blocks	Important Aspects of IoT BMC	International Business Model
Customer Blocks	Customer Segment	• Niche Market • Segmented Market	Rask (2014) IB Typologies • Domestic-based Business Models • Import-based Business Models • Export-based Business Models • Semi-global Business Models
	Customer Relationship	• Communities • Co-creation • Personal assistance • Dedicated personal assistance	
	Channels	• Web sales • Wholesaler • Sales force	Rask (2014) IB Strategies • Domestic-based Business Models • Import-based Business Models • Export-based Business Models • Semi-global Business Models
Financial Flows	Revenue Streams	• Subscription Fees • Asset Sale • Licensing • Usage fees • Lending/ renting/leasing • Installation fees	Child et al. (2017) IB Typologies • Traditional-market adaptive Business Models • Technology-exploiter Business Models • Ambidextrous-explorer Business Models
	Cost Structure	• Product development costs • IT costs • Marketing & sales costs • Hardware/production costs • Personnel costs	
Value Creation	Key Resources	• Software • Financial resources • Employee capabilities	**IoT Ecosystem** Westerlund et al. (2014) • Argues that traditional BM designs are not sufficient enough • Suggests connecting different parts of the BMC and create a focus on the flows and actions of different portions within a BM • Further suggests replacing the term business model with value design as a value design is more suitable for an ecosystem • Instead of looking at 9 blocks, we should look at 4; value drivers, value nodes, value exchange, and value extract
	Key Activities	• Product development • Software development • Customer development • Platform development • Service implementation	
	Key Partnerships	• Software developers • Hardware producers • Launching customers • Data analysis partners	
	Value Proposition	• Convenience/ usability • Getting the job done • Possibility for updates • Performance • Price • Newness • Accessibility • Cost reduction • Comfort • Customization	

3. Methodology

In this chapter, the research strategy and design used by the authors to conduct the research will be laid out. Furthermore, the data collection and analysis methods that were used and the reason why they were used are elaborated.

3.1 Research Strategy

When conducting a study, researchers have the option of either implementing a qualitative research (QR) strategy, or a quantitative research strategy. A quantitative strategy seeks to answer *how many,* whereas a QR strategy aims to create an in depth understanding of a certain context and/or investigating *how, why,* or *what* an organization needs to do (Bryman & Bell, 2011; Eriksson & Kovalainen, 2016). Therefore, it was decided for this thesis to utilize the QR strategy.

The reasons for this is because firstly, the purpose of this thesis correlates best with the purpose of a qualitative approach, due to the authors seeking to uncover what adaptations MNC's need to make to their international BMs in order to generate value through IoT. Secondly, since the authors of this thesis also wished to gain a deeper understanding of the complex nature of IoT, they decided to utilize a QR approach, which was deemed as the most appropriate research strategy according to Bryman & Bell (2011) and Golafshani (2003). As through this approach, not only will the researchers be able to observe how the phenomenon unfolds in its natural state, but through interviews they will also generate a deeper understanding of it and allow them to display their findings through real life cases. Due to these two reasons, the authors of this thesis decided that the qualitative research strategy was the appropriate approach to implement.

3.2 Research Approach

The research question developed by the authors originates from an initial interest in new technology, and how it impacts businesses. The focus was originally put towards IoT and its impact on business in general. However, after a literature review the focus was shifted towards IoT´s impact on international BM, as research gaps were identified within the field. As the aim of this study is to display what adaptations an MNC performs to its international BM due to IoT, an abductive approach was chosen for this study. The abductive approach can

be seen as a combination of the two main research approaches, deductive and inductive (Bell et al., 2019). This approach was selected due to the limited information on the subject amongst researchers and lack of established theories and empirical evidence within this area.

Abductive reasoning starts as the researchers encounter an area that puzzles or surprises them with the goal of explaining this area (Bell et al., 2019) Throughout this thesis the authors have continuously shifted back and forth between theory and empirical findings. According to Dubois & Gadde (2002) empirical findings are necessary in order to gain an understanding of theory and vice versa through a matching method they call "systematic combining". The authors adopted this systematic combining approach throughout the thesis as the empirical data was collected and analyzed. After the collection of initial data, modifications were made to the theoretical chapter as new aspects of IoT and BMs were discovered. During the analysis of the data, the authors continuously went back to various sections of the thesis such as the Introduction and Theoretical Framework with the purpose of comparing the findings to the theory. The authors did this in order to discuss and develop a further understanding of the empirical data, identify any similarities or differences between the theory and empirical findings, and generate new thoughts and ideas that made the recognized phenomenon less puzzling. By utilizing a systematic combining of theory and empirical findings, the authors were able to perform a thorough analysis of what affects IoT has on international BMs and how companies need to adapt their BMs in order to generate value successfully (Ibid.).

3.2 Research Design

To answer the research question that was set forth, it is important to identify and implement the proper research design. Since it is through the research design a framework is established regarding how the data is collected and analyzed, as well as reflects the decisions made by the authors throughout the research process (Bell et al., 2019). In Bell et al. (2019) five popular research designs are outlined, and through this proposed outline the authors of this thesis were able to select an appropriate research design that would most effectively help answer their research question. After analyzing the different designs, and keeping in mind the purpose of this study, it was decided that a multiple-case study design would be the most appropriate to utilize. As the purpose of this study is to identify and understand how companies generate value through IoT and what impact it has on the international BMs of multiple MNCs, a multiple-case study design was selected for a number of reasons. Firstly, as the research

question of this thesis is rather open-ended, it can be argued that this study is an exploratory study. According to Saunders et al. (2012) *"an exploratory study is a valuable means to ask open questions in order to discover what is happening and gain insights about a topic of interest"*. When examining the purpose of this thesis, it was quickly realized by the authors that an exploratory case study approach was needed to be utilized as they conducted exploratory type research such as; literature review, interviewing experts of the subject, as well as conducting in-depth interviews with individuals. Secondly, case studies are the most suitable research designs to utilize when answering *what*, how, or why questions regarding an object of interest (Idowu, 2016; Welch et al., 2011), as this study seeks to answer *what* adaptations MNCs implement to their BMs, the suitability of a case study compliments the purpose of this study. Thirdly, a case study allows for an in-depth explanation of the object of interest as it can provide a detailed and intensive analysis that other designs cannot (Bell et al., 2019; Yin, 2014; Flyvbjerg, 2006). As the purpose of this study is to identify and understand what impact IoT has, the enabling ability of a case study compliments the purpose of the study nicely and allows the authors to gain this deep understanding of the impact of IoT. Lastly, by conducting a multiple-case study, researchers are able to collect a wider amount of data and easily identify differences and similarities between different cases (Yin, 2018; Bell et al., 2019). The authors deemed this quality as important for their thesis as they sought to identify unique and general adaptations different MNCs made to their international BMs. Furthermore, through a multiple-case study the authors are also able to more thoroughly compare theoretical concepts with empirical findings allowing them to provide more compelling evidence compared to that found in a singular case study.

However, there are some critiques regarding case studies that need to be considered and accounted for (Idowu, 2016). These critiques include; differentiating it from a cross-sectional structure, the vast amount of time and resources it takes to conduct a multiple-case study, and difficulty of replicating it (Bell et al., 2019; Idowu, 2016; Yin, 2014). As a multiple-case study and a cross-sectional study are very similar and can be easily confused, it is suggested to distinguish the two designs (Bell et al., 2019). In a cross-sectional study the main focus is on yielding general findings in a quantitative matter, whereas in a multiple-case study the main focus is to uncover unique contexts as well as some commonality between different cases (Ibid.). In order to show that this study is a multiple-case study the authors repeatedly emphasized the purpose of this study throughout the thesis by stating that even though this study may find some general findings, the main focus is to uncover unique contexts of what

firms do to adapt their BMs to generate value from IoT. Moreover, as a multiple-case study takes a large amount of time and resources to conduct, the authors were inclined to make necessary arrangements to account for this. The arrangements that they made were (1) partner with each other in order to make this study achievable as this study is beyond the means of a single student. (2) Selecting cases that were within Swedish borders to keep costs at a bare minimum while collecting the necessary data. (3) Create a Gantt chart in order to effectively allocate tasks in a timely manner to ensure that the multiple-case study would be conducted efficiently within the predetermined time frame.

In an attempt to account for the criticism that multiple-case studies are difficult to replicate, the authors provided thorough descriptions of their research process (Figure 6) in the Methodology chapter with the purpose of ensuring that this thesis would be replicable.

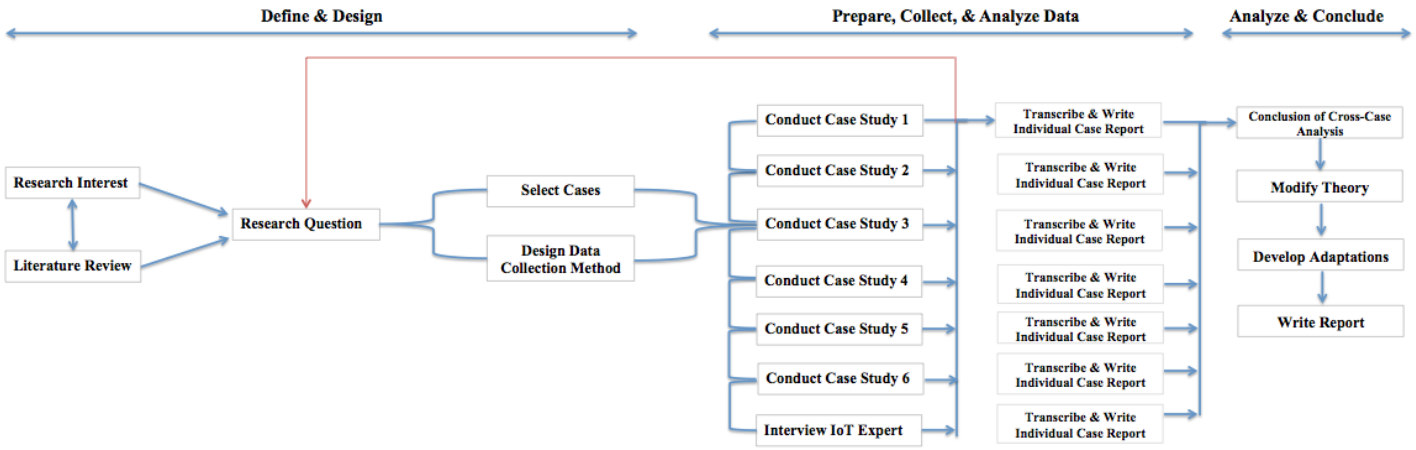

Figure 6: Overview of Research Design (adaptation by authors based on Yin, 2014)

3.3 Literature review

In the initial stages of developing this thesis the author conducted a literary review to create an overview of literature associated with IoT and BM. From initial reading the authors noticed a lack of empirical evidence within IoT and BM literature, which encouraged the authors to look further into the subject. According to Bell et al. (2019) a literature review can take the form of either a systematic review or a narrative review. A narrative review was chosen in this thesis as it was in line with the authors' need of developing an initial understanding and impressions of the topic of IoT and BM and to further develop a research question (Ibid.). Furthermore, the narrative review was used to summarize what was already known within literature in order to make up the theoretical framework for the thesis. A narrative review is

considered to be more prone to bias compared to a systematic review (Ibid.), however, it allowed the authors to maintain a wider scope, which enabled the identification of an additional aspect to the study, which was the international approach. The narrative review was also more appropriate for this thesis as it enabled the authors to change their view on theory after data had been collected and analyzed (Ibid.).

The objective of the thesis literary review was to identify articles regarding IoT and BMs from an international perspective. As no single article looked at all these aspects, the authors divided the literary review into different segments. The researchers identified articles looking at just BMs, international BMs, IoT from a more technical standpoint, as well as articles combining IoT and BMs. The search was initiated on the Gothenburg library database and extended to Google Scholar to gain an extended variety of literature. The most frequent keywords used were: business models, IoT, Internet of Things, IoT business models, international business models, and business model canvas. The literature identified provided the theoretical framework, which describes international BMs and IoT.

3.4 Data Collection

3.4.1 Primary and Secondary Data

Primary data is considered essential in order to answer the research question (Eriksson & Kovalainen, 2008) and the collection of primary data in this study was done through a 5-stage process. (1) The authors started with reading current literature regarding IoT and BMs in order to identify what companies to interview, as well as what questions would be relevant to ask. (2) The authors created a list of potential companies to contact and people to interview. (3) An interview guide based on the literature and theories studied was created and utilized throughout the study. (4) In-depth interviews with managers working with IoT were conducted as they were considered the best sources of primary data. The reason why the authors utilized in-depth interviews were due to the arguments of Eriksson & Kovalainen (2008) who suggested that in-depth interviews are seen as being the main approach for collecting data when conducting case study research. (5) Once the in-depth interviews were completed the authors transcribed the interviews and analyzed the raw data that had been collected. Furthermore, to increase the depth and validity of the report, additional secondary sources such as; annual reports, articles and company websites were utilized to verify certain

responses of the interviewees as there is a need for the case study data to be based on multiple sources (Eriksson & Kovalainen, 2008).

3.4.2 Company selection

The gathering of data is an essential part of research as the data is meant to create a better understanding of the theoretical framework and the selection of companies needs to be done with sound judgment. The intention of this study is to obtain a deeper understanding of how firms adapt their international business plan to IoT and identifying the right companies and employees for primary data sampling is crucial. To collect the required data the authors adopted a technique of purposive sampling, which is a technique broadly used within qualitative research where the researchers identify and select cases that are believed to be information rich (Etikan et al., 2016). A reason for adopting this technique was due to the need for identifying individuals with experience, who are considered well informed about the phenomenon of IoT and BMs.

To identify which companies to pick, the authors compiled a list of companies that they believed to have been affected by and were involved with IoT. Based on theory, it is companies that have a BM surrounding physical objects that will be affected the most by IoT and a focus has been on identifying these types of companies. The main criterion for identifying potential cases was that the companies were required to have an international presence as the authors wished to analyze IoT and BMs from an international perspective, and that they originated from Sweden. Companies were identified through several strategies, through the suggestions from Research institute of Sweden, the supervisor of this thesis, Google/LinkedIn searches based on initial knowledge, and referrals from previous interviews. A vast amount of companies were identified as potential cases and a shotgun approach was implemented in order to connect with the companies. The authors contacted more than 40 companies with the knowledge that most companies would probably not partake in the study, but with the goal of finding as many cases as possible for the study. Companies were also sampled from different industries with the goal of identifying both the general adaptations and unique adaptations that companies make to their BM due to IoT. The companies participating in this study were Volvo Group, Gunnebo Group, NEVS, Qmatic as well as two companies that chose to be anonymous. Nevertheless, one disadvantage of a purposive sampling is that it limits the possibility of generalizing compared to a random sampling technique since it is unsure if it represents the whole population. (Etikan et al., 2016). However, in order to limit

this disadvantage and gain an increased general understanding of what adaptations companies make due to IoT the authors conducted an interview with an IoT consultant at Alten in addition to the in-depth company cases.

3.4.3 Interview Structure

Before the interviews were conducted a specific person within the targeted organization was identified through the company's website or LinkedIn with the criterion of the person being a manager within IoT, technological development or business development. The identified individual was then contacted through Email or LinkedIn InMail (Appendix A) where the authors provided a quick introduction, the purpose of the study, and a request to be referred to another colleague if the initial contact believed that someone else in the organization was better suited to participate in the study. If the person was interested in participating in the study a time was booked for a face-to-face interview or by telephone and the interview guide was sent in advance. Once a time had been established the authors created an interview guide that was sent to the interviewees beforehand and would ensure that all interviews followed a similar structure (see Appendix B). The interview questions in the guide were based on the theoretical framework and could be categorized into four main categories. *First* the authors wanted to establish what the company's current BM looks like through the lens of the BMC. *Secondly*, questions were asked to gain an understanding of what the firms international BM looks like and the impact on IoT on that BM. *Third*, the impact of IoT on the different building blocks of the BMC was investigated. *Fourth*, questions were asked to determine if the firm is a part of an IoT ecosystem and what kind of challenges the firm has met in its implementation of IoT. The interviews followed a structure in accordance with Collis & Hussey (2014) where the interviewed moved from general questions too more specific. The interviews started with an introduction of the goal of the study and followed by classification questions such as the interviewees job title and previous experience with the goal of making the interviewee feel at ease before moving on to more demanding questions.

When conducting the in-depth interviews, a semi structured interview approach was utilized, as there was a need for detailed answers and the opinion of the respondent to answer the research question. The semi structured approach allowed the researchers to divert from the interview guide to gain further information on a topic when needed. Being able to go further into a subject brought up by the interviewee is considered important within qualitative interviewing, as there is great interest in the opinion of the interviewee. When the interviewee

is allowed to ramble and go off topic without being interrupted it enables more rich data and detailed answers to be gained from the interview and is considered to be one of the main benefits of conducting a qualitative study (Bryman & Bell 2015).

In this study a total number of 7 interviews were conducted between February 28th and April 21st. The individuals that were interviewed were managers within the firms that had a substantial knowledge of the workings of IoT as well as the BM and the international operations of their firm (Table 2). Due to their combined knowledge and experiences, this made the participants suitable to answer how IoT affects their firm and what adaptations that have been planned/made in order to generate value and deliver this value to the customers. All interviews except for 2 were conducted as face-to-face interviews and 6 out of 7 interviews were recorded, with 2 respondents electing to remain anonymous. The authors of this study kept the interview formats consistent with one-on-one, and favored the utilization of face-to-face interviews due to the advantages of being able to collect and gain an understanding of the comprehensive data directly by asking complex questions in person, and asking follow up questions when needed (Collis & Hussey, 2014). In addition, majority of the respondents were native Swedish speakers so the authors decided to hold interviews in Swedish when appropriate, helping the respondents feel comfortable when answering the questions. Once the interviews had been conducted the authors transcribed and translated the interviews as soon as possible in order to capture all relevant information. Once this process had been completed the authors sent back the transcripts to ensure that nothing had been lost in translation and that the authors had interpreted the answers correctly.

Table 2: List of companies and participants that were interviewed

Company	Participant	Titel	Date	Format	Interview Length
Volvo AB	Xiangxuan Xu	Senior Foresieght Manager	2020-02-27	Face-to-face	51 minutes
Company A	Anonymous	Director Product Management	2020-03-09	Face-to-face	66 minutes
Company 2	Anonymous	Digital Business Developer	2020-03-13	Face-to-face	81 minutes
Gunnebo	Mikael Sundebäck	Director Software Solutions	2020-03-19	Skype	76 minutes
NEVS	Daniel Roos	Head of Strategy & Business Development	2020-04-03	Face-to-face	75 minutes
Qmatic	Magnus Dahlbäck	SVP Strategy & Products	2020-04-21	Skype	56 minutes
Alten	Richard Rydell	IoT & Cloud Manager	2020-03-05	Face-to-face	54 minutes

3.5 Data Analysis

The process of data analysis is seen as an important procedure in order to structure the vast amount of data gathered in this study and to be able to draw conclusions from the data. The procedure developed in this thesis is in line with Collins & Hussey (2014) and Quinlan (2011), which suggests a process starting with reducing the data, followed by displaying the data and finally drawing conclusions from the data as well as verifying the validity of those conclusions. The first step taken in reducing the data was to transcribe and rewrite the primary data gathered from the interviews in order to exclude fragmented or incomplete statements. Thereafter, the transcribed data was reread and thoroughly studied repeatedly in order to identify the unique contexts, as well as common themes and patterns shared among the studied cases by using the theoretical frameworks presented in Part 2 of this thesis. To identify common themes and patterns the authors read the transcripts repeatedly and color coordinated key ideas and issues that intrigued the researchers in order to take a step away from the rawness of the data and take a step closer towards an abstracted understanding of it. The ideas and issues that the authors focused on color coordinating were the 9 building blocks that were identified in the BMC, information related to international business and any discussion regarding IoT ecosystems. Secondly, to display the vast amount of information and make it comprehensible, the data was divided and categorized in a systematic manner into the BMC from each case and summarized in the empirical findings chapter. Furthermore, the data from each case that were collected were then examined through the authors self-created analysis tool, and the findings were structured into tables 3-9 (which can be located in Part 4 of this thesis) displaying the identified themes and patterns developed for each case, which was then used as a basis for the analysis chapter. Lastly, Yin (2014) suggested when researchers analyze multiple cases they should use a cross-case analysis as this method will likely make findings easier and more robust. The authors adhered to this recommendation and a cross-case analysis was performed allowing the researchers to draw conclusions regarding what the impact of IoT has on MNCs, as well as the unique and general adaptations MNCs do to their BM to generate value from IoT.

3.6 Research Quality

Traditionally the different criteria's used to assess business research are *reliability,* which is concerned with the notion of consistency regarding whether a study is repeatable or not (Bell et al., 2019); *replicability,* the ability of a study that has been conducted to be repeated again

by someone else to ensure that the measured concept is reliable (Ibid.); and *validity,* the most important criteria as this describes the level of integrity to which the research findings are accurate and capture what they were set to capture (Ibid.). However these outlined criteria are favored towards quantitative research rather than QR, especially reliability and validity, as they are concerned with units of measure (Ibid.). Due to this it can become difficult to prove findings in a QR and requires a researcher to display another level of validity throughout their study (Flick, 2014; Bryman et al., 2019). Qualitative researchers have advocated for the usage of different criteria when evaluating QR and researchers such as Kirk & Miller (1986) have applied altered concepts of validity and reliability to QR. Additionally, Lincoln & Guba (1985) proposed the introduction of trustworthiness as criteria when evaluating QR and four different properties would make up the "trustworthiness" of a research study.

Credibility, would account for internal validity, and the purpose of credibility would be ensuring that the research findings that were revealed by the authors were credible. This is accomplished through respondent validation as well as triangulation (Flick, 2014; Bryman et al., 2019). In this thesis the authors adapted both techniques to guarantee the credibility of their findings by basing the questions asked in the interviews on the literature of previous authors, and providing the transcripts of the interviews and research findings to the parties that were interviewed to confirm that their answers were interpreted correctly. Furthermore, the authors ensured that the findings were not influenced by one single source of information by utilizing multiple databases to collect both primary and secondary data in order to control that the findings are not based on bias answers.

Transferability, would replace external validity, and suggests whether the research and findings can be transferred to other contexts (Bryman et al., 2019). Typically, QR is deployed in smaller sample groups and tends to focus on uniqueness of each sample compared to the generalization (Ibid.). The authors implemented the thick description technique throughout the methodology section of this thesis in order to give a detailed account of the data collection process and allow the transfer of the findings to other contexts.

Dependability, parallels reliability, and showcases the responsibility of the researchers to provide a clear and well-documented picture of the research process to the reader. This is important, as it is necessary to provide an audit trail to assist future researchers in replicating the thesis (Bell et al., 2019). The authors provide this blueprint throughout the thesis in the

Introduction, Theoretical Framework, and Methodology chapters by providing detailed descriptions of the concepts, limitations, and research processes that were used throughout the study.

Confirmability is concerned with objectivity and illustrates that the researcher has acted in good faith and made logical interpretations of the findings based on the data collected (Bell et al., 2019; Eriksson & Kovalainen, 2016), rather than on bias (Bell et al., 2019). The authors accomplished this by presenting a detailed description of the data from each case, and then conducting a thorough analysis of the empirical findings using the frameworks that were presented in the Theoretical Framework portion of the thesis.

3.7 Research Ethics

According to Bell et al. (2019) it is important to remember ethical issues that can arise at various times throughout one's research process. For this reason, researchers need to be aware of and prepared for the ethical issues that may arise and be able to properly address them in order to maintain integrity throughout their study (Collis and Hussey, 2014; Bell et al., 2019). There are several ways to ensure that ethical practices are implemented, and no harm has resulted from the research (Bell et al., 2019). The authors of this study utilized the recommended ethical practices that were highlighted in Bell et al. (2019) throughout their study. Through informed consent (Ibid.) the researchers corroborated with the participants in order for them to feel comfortable partaking in the study, as the authors ensured that the interviewees were educated on the purpose of the study and the intended use of the data by sending them the interview guide beforehand. Furthermore, before every interview the authors asked the participants if they wished to be anonymous, as well as for permission to use recording equipment during the interview for the purpose of transcribing the interview in the end. Lastly, the authors implemented the practice of researcher validation, in order to verify that there were no potential errors or misunderstandings of the data that was collected (Ibid.). The respective findings and the final report were sent to the appropriate participants for them to review and comment on so the proper revisions and representation would be presented in the final analysis and discussion of the study. These mentioned practices that the authors implemented coincide with the recommendations of Bell et al. (2019) to ensure that the participants right to privacy and confidentiality are not infringed on, as well as any harm is done through the research.

4. Empirical Findings

In this section of the paper, the authors present the relevant findings that were extracted from the interviews held with the managers of the MNCs. Each individual case is presented below and a summary table at the end of the chapter with the aim to highlight some of the key adaptations that the studied companies have made.

4.1 Volvo Group

Volvo Group (henceforth Volvo) is a world-leading provider of transportation solutions operating with their headquarters in Gothenburg, Sweden while having production facilities in 18 different countries and sales in more than 190 countries. Volvo manufactures a wide range of products such as trucks, construction equipment, busses, as well as industrial and marine engines. However, the truck division is by far the largest, amounting to 64 % of the net sales within the group. Through its mission *"To drive prosperity through transport solution"*, Volvo works towards integrating new technology to fulfill this mission (Volvo Group, 2020a).

4.1.1 Volvo Business Model

Volvo has recognized that customers demand different products and services, which requires Volvo to adopt more than one BM. Volvo has historically utilized very traditional BMs as a manufacturer of transportation solutions that has been based on selling hardware products such as trucks and busses directly to customers. Volvo is now implementing a range of new BMs in order to capture the opportunities deriving from the technological developments within electrified, connected, and autonomous vehicles, enabling Volvo to generate and provide new value for their customers (Volvo Group, 2020a). Six different customer needs have been identified that needs to be fulfilled by Volvo; *Vehicle parts, vehicle uptime, vehicle productivity, fleet productivity, mobility and platform solutions.* To successfully satisfy these needs Volvo will support their customers by having BMs linked to vehicles and equipment, financing and insurance, as well as connected platforms, where IoT plays an important role (Ibid.).

4.1.2 Volvo International Business Model.

Volvo is a global company where both production and sales are conducted on a global basis. BMs within Volvo are implemented on an international basis; however, the international presence of Volvo and differences amongst customer segments creates a need for Volvo to adapt their BMs to different markets (Volvo Group, 2020a). From the emergence of IoT, and the customer needs that arise with it, a platform called Volvo Connect has been created in order to accommodate the shift from solely providing products to also providing services. Volvo Connect is seen as a digital home for the vehicle that can enable efficient services in order to serve one or several of the previous mentioned six customer needs (Volvo Group, 2020b) Volvo Connect will play an important role in the BM linked to connected platforms on an international basis as Volvo Connect is being implemented worldwide. Volvo will take a standardized approach with the implementation of Volvo Connect on a global level where minor adaptations will only be made to the platform in certain markets and regions (Xiangxuan, 2020).

4.1.3 Volvo IoT Adaptations

4.1.3.1 Customer Blocks

In order to deliver the value emerging from the Volvo connect platform to its customers, Volvo needs to conduct adaptations to its BM. The customer segment building block will remain similar to Volvo´s traditional BMs where the goal of Volvo Connect and the additional services emerging from the platform is to retain their current customers and become more integrated into their operations (Xiangxuan, 2020). However, through Volvo Connect, third party actors can become customers as they purchase the possibility to be available on Volvo Connect, leading to an additional customer segment for Volvo (Ibid.). According to Xiangxuan (2020), Volvo Connect will enable stronger customer relationships to be developed with the customers as Volvo will provide more services and become more integrated into the everyday business of their customers. The data generated from the connected trucks will be used by Volvo to develop more personalized solutions such as route optimization for specific trucks within a customer's fleet and improving the comfort of the drivers. Furthermore, Volvo Connect will also be used as a means for co-creation amongst Volvo and its customers as Volvo will gain more insight into the operations of its customers and the opportunity to create more advanced solutions for the customer.

4.1.3.2 Financial Flows

When examining the financial flows of Volvo's BM, Volvo has made several adaptations to their revenue block in order to generate value through IoT. Previously Volvo has relied heavily on one-time sales of their assets, which has been their main revenue stream in the past (Xiangxuan, 2020). Volvo will continue to rely on revenue from one-time sales of their vehicles, but will also experience a shift towards recurring revenue. With their asset sales, Volvo will offer subscription possibilities of additional services to the products that they offer through Volvo Connect (Ibid.). When looking at the cost structure block, the adaptations that Volvo has made to their BM in order to capture the value generated by IoT is increasing their expenditure within research and development (R&D). Volvo has done this in two different ways; firstly they have created the Volvo Group Connected Solutions whose aim is to act as a change agent and assist Volvo Group in developing solutions and services through Volvo Connect and internally develop an app store (Volvo Group 2020c). Secondly, Volvo has also created a separate group known as Volvo Group Venture Capital, and through this group Volvo seeks to drive new business growth by identifying and purchasing shares of innovative companies participating in the transformation of the transport industry (Ibid.).

4.1.3.3 Value Creation

Value creation surrounding IoT derives to a large part from the R&D division Volvo Group Connected Solutions. The development of software and the Volvo Connect platform stands as a key activity according to Xiangxuan (2020) and the main key resources in the value creation for Volvo are the employee capabilities within Volvo Connected Solutions. Volvo aims at gaining a first mover advantage through its Volvo Connect platform and thus prioritizes activities within the connected solutions division to be able to provide new services to its customers in a rapid manner (Ibid.). In the value creation process, partners are an important part and the company is working with a variety of key partners in two ways. Volvo has developed partnerships with companies of different sizes that provides hardware and software that is crucial for the development of the IoT solutions provided by Volvo. In addition to forming partnerships, the venture capital fund developed by Volvo has acquired startups, which has been seen as essential for further development of IoT related solutions (Ibid.).

4.1.3.4 Value Proposition

Through the Volvo Connect platform Volvo will be able to offer a wide variety of services that will improve the performance of its customers (Volvo Group, 2020b). More efficiency will be enabled within fleet management for its customers through route optimization and drive automation, which will result in cost reductions in terms of fuel and employee costs. Additionally, uptime of Volvo´s vehicles will be increased as IoT will inform when reparation of the vehicle will be needed as well as self-service of the vehicle through augmented reality. Customers will also gain increased value in terms of improved quality for the driver of the vehicle. Volvo Connect will provide applications and solutions, which will increase the safety for the driver but also the comfort and help the driver balance the life on the road and family (Xiangxuan, 2020).

4.1.3.5 IoT Ecosystem

Xiangxuan (2020) discusses the importance of IoT ecosystems and that Volvo believes that the company is a part of an IoT ecosystem. Through the Volvo Connect platform, Volvo has taken a very central role in its IoT ecosystem as the platform creator. As Volvo aims at benefiting from the first mover advantage, initiating the platform then creating an ecosystem surrounding the platform is deemed important. Volvo has then adopted an open innovation approach to its platform, which has enabled third party actors to easily develop services for the Volvo Connect platform. The plan of being the platform initiator has required a substantial amount of resources for Volvo; however, it has given the company a very central role in its IoT ecosystem (Ibid.).

Table 3: Summary of Volvo Group findings

Volvo Group	Adaptations made to BM	International Business Model
Customer Blocks	• Retain current customers • Gain 3rd party software developers as a new segment • Stronger and more direct customer relationship • Become more integrated into customers business • Personalized solutions • Co-creation • Utilization of app	• Semi global BM • Increased standardization of BM • Through IoT, will be able to make minor regional adaptations when applicable
Financial Flows	• Shift from asset sale to recurring revenue • Subscription • Rent/leasing • Product development costs • Expenses in acquiring smaller companies	**IoT Ecosystem** • Platform creator • Central role within ecosystem • Open ecosystem to promote innovation
Value Creation	• Software development • Platform development • Collecting knowledge of customer • First mover advantage • Software • Employee capabilities • Partnerships with hardware and software suppliers • Collaborations with startups	
Value Proposition	• Improve performance and efficiency for customers • Improve quality and uptime of vehicles • Cost reduction • Increase safety and comfort	

4.2 Company A

Company A Group is a MNC that operates in over 140 countries and a leading global producer of outdoor power products for several different industries such as; forest, park and garden care, and construction (Company A Group, 2020a). When looking at their history, it is unveiled that since their foundation Company A Group has had a passion for innovation and creating performance, pride and improved results for their customers by offering a wide variety of products (Company A Group, 2020a; Company A Group, 2020b). Today Company A Group delivers premium products and services through their three divisions; Company A, Company B, and Company C (Company A Group, 2020a). In this thesis Company A, which offers products for forestry, tree care, landscaping and other commercial lawn and garden services and accounts for 65% of the Groups net sales (Company A Group, 2020a), was the main point of interest for this study.

4.2.1 Company A business model

When examining the BM of Company A their main focus is to provide innovative products and solutions that promote productivity, safety and sustainability to their different customer segments (Company A Group, 2020a). When examining their customer segments Company A

targets four main segments; landowners, middle class, professional landscapers, and forestry care companies (Company A respondent). Company A reaches their customers through external distributors and retailers as their main channel to market in addition to online sales (Company A Group, 2020a). Company A highlight key partners within their BM as being suppliers and smaller firms that help develop their range of services and technical capabilities (Company A respondent). Company A sees their main key resources as being their knowledge within application areas, their brand, and their ability to industrialize processes in an efficient manner as they prioritize the ability to identify the demands of their customers and offering the correct high-quality products for them (Ibid.). Key activities follow suit of key resources and Company A mentions again the importance of development and production. Lastly, when examining the financial flows of Company A, they state that majority of their revenue comes from one-time product sales and there is some revenue that is generated from providing financial and warranty services. The cost structure of Company A is one of a traditional industrial company including production costs, development costs, and IT infrastructure (Company A respondent).

4.2.2 Company A International business model

Company A has adopted a semi-global BM as they have production sites in several different countries and source other activities and materials from all over the world (Company A respondent). Even though Company A has such a global footprint both in production and sales, when it comes to implementing an international BM they use a rather standardized BM across majority of their markets. However, with the North American market Company A has implemented a BM that differs greatly from the standard one. The reason for this is due to the important role that retailers hold in the North American market. To ensure their success there, Company A has a larger interest in the retail network in North America compared to other markets that they currently operate in. Overall, Company A has a semi-global BM that has a standardized base where they have only made adaptations to their interest in the network of retailers that they utilize depending on the market (Ibid.). According to Company A respondent (2020), IoT has not at this time affected Company A´s international BM to any large extent. Nevertheless, IoT will enable Company A to develop a more direct and personal relationship with its end customers that could result in increased adaptations in the international BM on an individual basis rather than a market or country basis.

4.2.3 Company A IoT Adaptations

4.2.3.1 Customer Blocks

Company A will utilize IoT to create a stronger relationship with its current customers. While the company's customer segments will remain the same, the company will through IoT be able to develop more personal relationships with its customers (Company A respondent, 2020).

"We will have the opportunity to more efficiently adapt the experience depending on the customer on an individual basis rather than within segments. We talk about segment of one and not to generalize but to individualize. It is likely that we will be choosing how our digital services will be presented depending on who you are, what products you have and how good you are at utilizing them" - Company A respondent (2020)

Company A respondent (2020) discusses that the company's ability to gather data and information directly from the final customer, Company A will be able to gain more insight to the final customer in order to co-create products, establish a deeper relationship, and create a stronger brand, which has become important within the industry. IoT will enable a shift in the channels used by Company A from a strong focus on distributors and retailers to more direct sales towards the final customer. However, the distributors and retailers will continue to be the main channel to market for a foreseeable future due to the strong network that has been developed and the key functions played by the retailers and distributors in terms maintenance and service of the products (Ibid.).

4.2.3.2 Financial Flows

New types of revenue streams will be enabled for Company A due to IoT. The company has started providing services towards their professional customers and fleet management of products on a subscriptions basis. In the future it is likely that there will be a substantial shift from upfront asset sales towards recurring revenue models and Company A will move from being a pure product company to becoming a product and service company (Skyborn, 2019).

" We believe that there is a shift towards services through our entire business were we instead of selling the products offer services in one way or another. Simpler solutions will look like the car industry and private leasing were everything is included. More advanced

models are also possible were we take more responsibility with a subscription model with recurring revenue instead of upfront and this is something that I believe will occur gradually over the upcoming years." - Company A respondent (2020)

In response to the adaptation created to generate value from IoT, Company A has developed additional costs and sees increased costs within product development, as most of the production is performed in-house. While some components associated with back end functions are purchased, the integration of the different components is performed in-house. Furthermore, there is also the cost of collecting data and the cloud services associated with the data collection. Company A has found that there is a strong business case in connecting their products, as customers are willing to pay a premium price. However, so far the company has not found a way of cutting internal cost but has to offset it with revenue (Company A respondent, 2020).

4.2.3.3 Value Creation

Company A respondent (2020) mentions in-house development of the IoT related products as an important activity in the value creation process. To handle new technological development, Company A has developed a new staff function called robotic digital innovation who are in charge of securing the next generations digital and robotic business, which they believe will be a core of their BM in the future. The employee capabilities within this staff function are seen as important key resources in the development of IoT solutions. Furthermore, understanding what the customer wants is seen as a key activity, Company A deems this knowledge of their customer needs as important since Company A wants to understand what value they can provide to their customer. The last key activity that Company A has adopted due to working with IoT is identifying strong business cases and making sure that everyone is invested in the project (Ibid.).

" The most common success factor within IoT and almost any other business projects is to create a clear picture of the business case and why we do it but also it is good to create incentives for everyone involved that is contributing to the value creation" - Company A respondent (2020)

Due to the implementation of IoT, telecom operators have become an important key partner for Company A, as they are crucial to the possibility of creating the connected solutions.

Other key partners for Company A are startups, large software companies, and other types of firms that provide back end functions associated to subscription and BMs, which enables the activities related to IoT (Company A respondent, 2020).

4.2.3.4 Value Proposition

The new solutions developed around IoT have the potential of providing increased value to the customers. As the new products developed by Company A are connected, they provide improved usability and performance, as the customer is able to access the product from anywhere. It is also possible to integrate the product with SMS services and calendar functions that can tell when the product should be switched on and off or if it is in need of service or maintenance (Company A respondent, 2020). For larger fleet customers the new IoT solutions could help reduce the cost for the customer, as they will receive information on how the products are actually used (Skyborn, 2019). The new types of recurring revenue streams that are enabled by IoT will also provide value for Company A´s customers as the customer will be able to purchase a product by subscription instead of an upfront cost, which gives the customer more flexibility in their methods of payment (Company A respondent, 2020).

4.2.3.5 IoT Ecosystem

Company A respondent (2020) mentions that Company A believes that they are a part of an IoT ecosystem as their products are integrated and work together with other partners such as; telecom operators and large software companies for example Amazon and Google. Nevertheless, Company A aims to find certain niches in the ecosystem rather than trying to own the whole ecosystem themselves.

"Perhaps nobody will own the ecosystem, but it will come down to contributing with what you are really good at, otherwise someone else will do it more efficiently" - Company A respondent (2020)

Company A works towards creating an open IoT ecosystem with others as they do not believe that they can do everything themselves. To accomplish this, Company A has open application program interfaces making it possible for others to develop solutions towards Company A´s products. The company also works with third party operating platforms such as IFTTT, which

is a smart platform that integrates different types of products and services and works as an enabler for the whole ecosystem (Company A respondent, 2020).

Table 4: Summary of Company A findings

Company A	Adaptations made to BM	International Business Model
Customer Blocks	• Retain current customers • "Segment of one" • Stronger and more direct customer relationship • More insight of final customer • Increase loyalty • Co-creation • Possibility of bypassing sales partner	• Semi-global based BM • Increased standardization of BM • Currently IoT has not largely affected international BM
Financial Flows	• Shift from asset sale to recurring revenue • Subscription • Rent/leasing • Cost of backend functions • Software and cloud costs • Product development costs	**IoT Ecosystem** • Aims to find certain niches in ecosystem • Focusing on area of expertize • Working towards an open ecosystem • Works with third party operating platforms
Value Creation	• In-house development • Software development • Identifying strong business cases • Collecting knowledge of customer • Software • Employee capabilities • Employee knowledge • Telecom operators • Collaborations with startups • Partnership with software developers	
Value Proposition	• Improve usability and performance • Predictable maintenance • Flexibility in methods of payment • Personal product packages	

4.3 Company B

The Company B Group operates in several different lines of businesses all around the world (Company B AB, 2019). Even though each individual business have their own cultures and values, each business is based on a clear ownership philosophy and must follow Company B Group's principles, convictions and basic values (Ibid.). In this thesis it was decided however to focus on the individual operations of only one of the groups businesses, Company B. Company B is one of the world's leading tanker shipping companies that was founded in 1982 and is apart of the Company B Group (Company B, 2020). As their customers are major oil and chemical companies, Company B is expected to provide maximum safety, flexibility, and transport economy when moving crude oil and refined petroleum products by sea. (Ibid.). In

order to adhere to their customers high demands Company B seeks to provide innovative solutions to satisfy these transport and logistical needs (Ibid.).

4.3.1 Company B Business Model

Company B's BM is rather simple, they transport any liquid that can be pumped through a pipe such as; crude oil, liquid natural gas, or palm oil from point A to point B within mutually agreed terms of a signed contract between them and their customer (Company B respondent, 2020). Company B operates in an industry whose customer segment consists of large traditional companies such as oil majors, pharmaceutical companies, and chemical companies. Since Company B's customer segment is old-fashioned, Company B considers it important to maintain a strong relationship with both their customers and the business brokers who serve as their channels (Ibid.).

Company B has several important partners, including International Maritime Organization (IMO), harbors and ports. However, their most critical partner is the Company B Group and the lines of businesses that are associated within the group. Without these businesses and the support of the group, Company B would not be able to succeed as they rely on the resources that are provided to them through the group such as funding and the necessary access to an additional workforce that possesses specialized knowledge and expertise. When looking at financial flows, Company B's revenue derives from acquiring contracts to transport the goods of the customer. From cost structure, Company B's main cost is from the depreciation of their vessels as well as fuel, personnel costs, taxes and other fees that they may be required to pay. (Company B respondent, 2020)

4.3.2 Company B International Business Model

Company B considers their international BM to be a semi-global BM as the cargo that they transport are loaded in one country and unloaded in a different country with their shipping routes crossing international waters (Company B respondent, 2020). Due to this, the company has seven offices that are spread across different time zones that share the responsibility of monitoring their fleet, as well as handling different types of cargo. Company B respondent (2020) describes that since the nature of their business is rather direct, Company B does not need to implement several different types of BMs around the world in order to provide the necessary value to their various customers. Instead they can utilize a standardized BM as a

base and make any necessary pivots to it depending on the product they are transporting, where in the world they are transporting it to and from, and what type of harbor or port they will be docking at. Company B believes that IoT will have a large effect on the international BM as they have a very standardized international BM. However, according to the Company B respondent the effects on the BM will be inside the various BM blocks and not in terms of standardization or adaptation of the international BM.

"Considering that our entire business model is international, IoT will greatly affect us in the future." - Company B respondent (2020)

4.3.3 Company B IoT Adaptations

4.3.3.1 Customer Blocks

When examining the customer segment and how IoT will impact this portion for Company B, IoT will not have a large impact on the customer side. Even though Company B plans to implement changes to their BM, Company B believes that they will retain their current traditional ones. However, Company B has thought about the possibilities of selling the data that they will collect through the mounted sensors on their fleet in the future to new segments such as traders or stock market (Company B respondent, 2020).

"On the customer side it will be static, however on the stakeholder side for example with financial control groups or government organizations such as IMO will change" - Company B respondent (2020)

Company B foresees that IoT will affect the relationships that they have and the sales channels that they utilize. Currently Company B does not directly negotiate or handle sales with their customers but instead they utilize brokers to acquire contracts and business for them. Company B aims to explore the possibilities of developing a type of app that will allow the firm to gain more control and transparency of their operations and develop a more direct relationship with their customers, as well as changing the company's level of reliance on brokers to acquire contracts for them (Company B respondent, 2020).

"It would be difficult to see any changes within the next 10 years how we conduct business unless the larger customers would force the changes. Nonetheless, within 20 years it could

change and perhaps we could conduct business through apps much like how people trade through Avanza." - Company B respondent (2020)

4.3.3.2 Financial Flows

Even though Company B will not be changing the core of their BM, Company B respondent (2020) believes that through IoT the firm will be able to tap into new revenue streams. Company B will explore the possibilities of developing and selling platforms that contains collected data to other interested parties through a range of different revenue models such as licensing fees, SaaS models, or retaining traditional B2B/C models. Nevertheless, the largest impact that Company B sees IoT will have on their revenue stream is the ability of increasing their revenue by allowing them to offer more precise and economically efficient contracts. Through IoT, Company B believes that they will be able to acquire crucial data that will allow them to offer more market reflecting contracts, which will benefit both their customers and themselves. From a cost structure perspective Company B predicts that they will experience a short-term increase in costs due to them having to develop the software or hardware that allows them to install and benefit from IoT enabled products. Nonetheless, they deem this increase as a necessity since through IoT they will be able to further analyze and gain a deeper understanding of their own operations. Through this new detailed knowledge of their tangible costs that they uncover of their operations, Company B will be able to significantly cut down costs in areas such as fuel consumption and regulatory fines (Ibid.).

"IoT would certainly help with for example fuel optimization. As fuel for our boats is our largest cost, with IoT we would be able to properly measure the performance and fuel consumption of our boats and could help us save 3% more fuel. Furthermore, IoT would allow us to accurately track and count tangible costs" - Company B respondent (2020)

4.3.3.3 Value Creation

Company B respondent (2020) describes three adaptations that Company B has done to their key activities due to IoT. Firstly, they have set up separate groups within the organization who are in charge of IoT related projects. Secondly, it is important for Company B to make the proper analysis of what they should develop in-house as well as how IoT should be implemented internally to maximize collection of relevant data and limiting the wastage of financial resources. Thirdly, since the company works in a rather traditional industry another

key activity that they have to adapt is the persuasions of top management as well as the Company's personnel to be onboard with the idea of IoT enabled services and understand why they are making these changes. It is critical to be clear and provide concrete information such as timelines and monetary numbers, especially to their stakeholders in order to acquire and retain the most important key resource, financial backing. Without financial resources Company B would not be able to pay for the development of their current IoT projects, as well as the salaries of their employees and developers, as having the right human resources is another key resource for Company B. Company B respondent (2020), believes that IoT will affect key partners as they hope to develop stronger partnerships with harbors and ports that their ships utilize. They also desire to be able to create an even more beneficial quid pro quo relationship with them as Company B will be able provide relevant and informative data to them, an example being live data of the ports congestion. Company B has also considered the possibility of creating an alliance or partnership with smaller firms or startups in the future. However, currently they have not found anything that they deem beneficial at this moment (Ibid.).

4.3.3.4 Value Proposition

IoT will allow Company B to deliver an entirely new value proposition to their customers, as they will be able to provide a larger amount of control and transparency of their operations to their customers (Company B respondent, 2020). According to Company B respondent (2020), 95% of Company B's services are performed via ships, by mounting sensors to their fleets they will be able to more accurately measure the performance of their boats ensuring that they are operated as efficiently as possible, and adhere to all international environmental regulations in regards to transportation. Furthermore, through IoT Company B will be able to digitize and then digitalize information and different portions of their operations, which in turn will allow them to ensure that all personnel and actions performed meet the criteria of Company B's high standards, creating a greater sense of security for their customers that they are in good hands and that their products are transported in the most sustainable way possible. Lastly, Company B also plan to share data collected throughout their trips with environmental organizations to assist in the tracking and conservation of marine life, which could create goodwill for both Company B and their customers (Ibid.).

"Something we really want to do, and was the main inspiration for one of our systems was creating more transparency as a lot of our operational activities are performed through

traditional measures such as conducting business through telephone, email, and relations. If we would be able to digitalize our entire value chain, from acquiring the contract to the completion of the voyage we would be able to increase transparency through IoT as it would allow us to provide more thorough and up to date information flows." - Company B respondent (2020)

4.3.3.5 IoT Ecosystem

With regards to adapting their BM in order to accommodate for an IoT ecosystem, Company B respondent (2020) stated that in their line of work any type of IoT ecosystem is in its very early stages of development and is not anything that they are currently adhering to momentarily. However, Company B believes that in the future it is critical to become involved in an ecosystem and they are keeping their eyes open for the development of a consortium that they would be willing to buy themselves in on, while simultaneously also developing their own ecosystem in order to drive discussion and inspiration of the creation of an interconnected ecosystem within their industry (Ibid.).

"Everything is so immature in today's case, there are ecosystems we would be willing to buy in on but at the same time we are also looking at creating our own to drive the creation and development" - Company B respondent (2020)

Table 5: Summary of Company B findings

Company B	Adaptations made to BM	International Business Model
Customer Blocks	• Retain customer segment • Possibility to gain a new segment outside of current industry • Stronger and more direct customer relationship • Become more integrated into customers business • Co-creation • Possibility of bypassing sales partner • Utilization of app	• Semi-global based BM • Utilizes one type of international BM • Historically standardized BM • IoT will have a large impact on international BM
Financial Flows	• Stronger contract negotiation ability • Sell access to platforms that contain collected data through multiple revenue models • Short-term increase in costs • Cut larger tangible costs that are present in current operations • Product development costs	**IoT Ecosystem** • Important to consider in the future • There is no current ecosystem for them to utilize in their industry • They are currently working on developing an ecosystem in order to drive discussion
Value Creation	• Software development • Create small groups that are responsible for IoT projects • Collect significant and relevant data • Software • Financial resources • Employee capabilities • Employee knowledge • Harbors and ports • Partnership with software developers • Collaborations with startups	
Value Proposition	• Goodwill • Offer larger amount of control and transparency • Greater sense of security	

4.4 Gunnebo Group

Gunnebo Group (henceforth Gunnebo) is a company that provides security solutions consisting of approximately 4,500 employees with its headquarters in Gothenburg Sweden. Gunnebo was founded in 1764 as a company providing nails and chains for the shipping industry but started providing security solutions globally after being acquired by a venture capital fund in 1995 (Gunnebo, 2020). Gunnebo consists of three main segments, entrance control, safe storage and cash management (Ibid.) as well as a fourth segment called integrated security which consists of a wide range of products that does not fit in to the previous main segments (Sundebäck, 2020).

4.4.1 Gunnebo Business Model

Gunnebo has adopted a BM that is centered around the customer. By taking this approach Gunnebo is able identify the underlying market drivers that works as a basis for creating

focused strategies within each business unit (Gunnebo, 2020). The four different business units formulate their own BMs within each segment and are further broken down on a product by products basis. Gunnebo has implemented the BMC on an overall company basis; however, it is modified within each segment and in many cases for each product. This results in very specialized BMs that are customized for fulfilling special customer needs (Sundebäck, 2020).

" You need to have the ability to rise above what you are doing and really get into the lap of the customer to understand the problem" - Sundebäck (2020)

4.4.2 Gunnebo International Business Model

Gunnebo grew into a strong global player within security solutions between 1995-2005 as Gunnebo acquired almost 50 companies around the world (Gunnebo, 2020). Today, Gunnebo is established on 133 markets with production facilities in 20 different markets, and components and products flows between the markets. In an international context, Gunnebo maintains its focus on product segment and customers BMs but the country that the product is sold to can also impact the BM (Sundebäck, 2020). According to Sundebäck (2020), IoT will play a different role in different markets for Gunnebo and the company will face different challenges depending on the market. The technological maturity of a certain market will affect the importance of IoT, as some well-developed markets will require IoT enabled products, whereas some markets will not. Due to this, it will be essential for Gunnebo to know when to prioritize IoT enabled products in order to have a competitive edge over competitors, and when they do not need to push the sale of their IoT enabled products. IoT will also enable Gunnebo to enter markets with less resources than previously required, allowing Gunnebo to relocate resources somewhere else without sacrificing any quality in the service they provide for the customer (Ibid.).

4.4.3 Gunnebo Group IoT Adaptations

4.4.3.1 Customer Blocks

According to Sundebäck (2020) Gunnebo´s strong focus on individual customers will continue even with the incorporation of new IoT technology. The approach regarding IoT is not that it should open up new customer segments but instead be used in order to develop the current customer segments and increase quality and functionality within the customer

segments. IoT enables stronger customer relationships for Gunnebo as the company becomes more integrated into the business of its customers. An example of this is the data collected by Gunnebo, which can be used to assist the decision-making processes of the customer or even to the extent that Gunnebo can make suggestions on what decisions the customer should make. Furthermore, IoT can enable Gunnebo to create new customer relationships that can help Gunnebo gain a better understanding of the end user and how to further develop their products (Ibid.).

"IoT can make it possible of a relationship with customers that we did not previously have since we send products down 3-4 lines out in the world and did not know where they ended up. Now we can come closer to the final customer and gain an understanding of who the final customer actually is. It does not necessarily have to be a business relationship but could be in terms of feedback on how we can improve our products and what value we provide at the end of the chain." - Sundebäck (2020)

4.4.3.2 Financial Flows

Through the use of IoT and connected products Gunnebo can adopt new revenue streams in addition to the traditional asset sale. The physical product will still be essential as new services are added onto the product that creates a revenue stream through subscription over time. The shift from just selling products with an up front revenue to subscription models will have a short-term negative impact on the cash flow of the company as revenue is shifted towards the future while the production costs remain the same. Nevertheless, Gunnebo believes that the shift to recurring revenue models could be beneficial for them as they have traditionally created high quality products with very long life span, meaning that the total revenue gained from the product is collected over time with a subscription model compared to the traditional asset sale. Gunnebo will maintain their strong focus on the needs of the customer in terms of revenue models and in addition to the subscription model offer leasing, renting and usage fees for its customers (Sundebäck, 2020).

"When it comes to per consumption or subscription we must be flexible in our solutions so we understand what the other side of the customers business model looks like. If he gets paid per consumption by his customers, it helps us become competitive if we also get paid per consumption." - Sundebäck (2020)

Sundebäck, (2020) sees that there could be significant changes in Gunnebo's cost structure in the future. Today the main costs come from product development and production. In the future it is likely that cost of ownership will play a large part of the cost structure, as Gunnebo needs to service and maintain the product for a certain amount of years. This results in a shift from looking at the costs of creating the product, to looking at the warranty time of the products as it is being used to provide a service to a customer (Ibid.).

4.4.3.3 Value Creation

In the value creation process, Sundebäck (2020) sees IoT as a necessity in order to develop the demanded products and services, as well as maintaining their competitiveness within the market. Gunnebo has identified that a key activity is to keep much of its product development in-house. Gunnebo has founded a new company that is run as a startup where much of the technological competencies have been gathered for product development but an important task within this startup is also to understand and question new trends and developments in the industry. Gunnebo found it important to have their software and cloud development centralized and collects the essential competence to create a startup with an innovative environment that can report directly to top management. The startup is centered on the development of software, which IoT is a part of but works also as a building block and an enabler for other aspects of the product development. While some resources are purchased from external partners, the competencies and knowledge of the employees are seen as key resources as they have the understanding of the business to create value from the external resources. Gunnebo has developed key partnerships with some of their external partners due to IoT, for example partners have developed from just being a supplier to becoming a commercial partner for Gunnebo (Ibid.).

4.4.3.4 Value Proposition

IoT plays a role as an enabler for connected products and provide new services, functionalities and BMs for the customer. Gunnebo is providing additional functionalities for their customers by using the same interface for their products and connecting products from different divisions into the same app in order to increase the convenience for the customer (Sundebäck, 2020). In order to provide additional services, Gunnebo is currently looking at what to do with the data that is collected from the customer and how to use it to deliver value for the customer (Gunnebo Group, 2020)

"Right now, there is a lot of talk about what we can do with the data that is collected. What can we do to draw conclusions and offer support in decision making and provide recommendations based on the collected data, or at least provide the data to the customer so they can draw their own conclusions." - Sundebäck (2020)

The next step for Gunnebo will be to provide value for the customers by assisting them in cost reduction. Through IoT Gunnebo will be able to deliver predictive maintenance and improve their service of the products by knowing beforehand when the product is in need of service. Furthermore, Gunnebo aims to provide smarter designs of their products in order to improve product lifecycle (Sundebäck, 2020).

4.4.3.5 IoT Ecosystem

Sundebäck, (2020) believes that Gunnebo are a part of an IoT ecosystem and the company tries to involve themselves in as many different IoT ecosystems as possible with the aim of increasing functionality, were Gunnebo is a part of a larger solution built mainly by other software developers.

"I believe that it is about doing what you are good at and being a cog in a large machine and make sure that you fit into as many large machines as possible instead of forcing the customer into a machine fully provided by us." - Sundebäck (2020)

Sundebäck, (2020) sees that large software developers such as Google, Microsoft and Amazon will play a big role in the IoT ecosystems and Gunnebo will have to make a choice between these tech giants and adapt when to use them depending on the product and customer segment. Gunnebo believes that it is important to be flexible towards new BMs and adapt the more traditional ones to new driving forces such as IoT ecosystems. By being part of a larger system and integrating the products to a larger software solution the customer will be able to purchase one product from Gunnebo and one from another company and gaining a higher value than if the products would have been used individually. Nevertheless, Gunnebo will still maintain some of their simpler solutions in a closed system where the company will provide an end-to-end solution (Ibid.).

Table 6: Summary of Gunnebo findings

Gunnebo	Adaptations made to BM	International Business Model
Customer Blocks	• Retain current customer segment • Become more integrated into customers business • Better understanding of final customer • Co-creation	• Semi-global based BM • Implements multiple BMs • All BMs are adapted to the products specific customer segment • More accurate resource allocation
Financial Flows	• Shift from asset sale to recurring revenue • Subscription • Usage fees •Negative impact on short-term cash flow • Increase in cost of ownership • Product development costs • Software and cloud costs	**IoT Ecosystem**
Value Creation	• Inhouse product development • Software development • Cloud development • Creating a startup to drive development • Collecting knowledge of customer • Software • Employee capabilities • Employee knowledge • Becoming closer with new strategic partners in other industries • Partnership with software developers	• Involve themselves with as many ecosystems as possible • Not trying to create an ecosystem by themselves
Value Proposition	• Increase quality and functionality of customers • New services added onto sold product • Providing additional functionalities for their customers • Increase convenience • Support in the decision making and provide recommendations for customers • Deliver predictive maintenance • Improve product lifecycle	

4.5 NEVS

National Electric Vehicle Sweden AB (NEVS) is a company founded in 2012 that designs premium electric vehicles and mobility experiences that are simple, engaging and distinctive (NEVS, 2020). Additionally they aim to shape sustainable mobility solutions based on electric vehicles for individuals, businesses, and society. With this vision NEVS will not only supply fully electric vehicles for private use, but also supply self-driving mobility vehicles, mobility systems, and services. Even though NEVS is a relatively new company, they have been able to expand quickly as they have established production sites in both Sweden and China, as they plan to enter both the Chinese and European electric vehicle (EV) market within the next couple of years (NEVS, 2018).

4.5.1 NEVS Business Model

Due to NEVS being a rather new company compared to other firms that were interviewed in this thesis, NEVS BM has already been developed to take into consideration of the future value that IoT will bring them. Nevertheless, when looking at the customer blocks of NEVS BM, NEVS has decided to target a wide variety of customer segments, which include individuals, businesses, and cities (Roos, 2020). NEVS have prioritized to create a direct and close relationship with their customers by utilizing their app as a sales channel. Furthermore, NEVS seek to utilize their parent organization Evergrande Health as an additional channel, as Evergrande Health is one of China's largest real estate companies who have the necessary knowledge and influence to help generate sales and allow NEVS to be successful in the Chinese EV market (NEVS, 2019).

Partnerships are crucial for NEVS and they can range from municipal offices to real estate development companies to the suppliers of software and hardware products that NEVS needs. Examining key resources that are essential in NEVS BM it was determined that they purchase a large amount of resources, making financial resources a key resource (Ibid.). Furthermore, cloud operating systems; workforce capabilities and knowledge were deemed as key resources for NEVS. The cost structure of NEVS is considered rather traditional of an industrial company and most of their costs will come from outsourcing a lot of activities and acquiring necessary hardware and knowledge. On the revenue side they will have several different revenue streams including asset sale, usage fees, subscriptions, as well as leasing/lending/renting (Ibid.).

4.5.2 NEVS International Business Model

When examining NEVS international BM, Roos (2020) states that they currently implement an early version of a semi-global BM, and the reason for this is due to NEVS having multiple production sites that supply exclusively for certain markets. The production site that they currently have in Sweden will be used mainly for the European market, whereas the production sites that they have recently constructed in China will be used exclusively for the Chinese market. However, as NEVS further develops and expands their operations they will develop their international BM into a more pure semi-global BM to allow the company to become more efficient, minimize costs, and maximize the profit of their operations (Roos, 2020). Furthermore, Roos (2020) commented that due to the diverse customer segment that

they target in their BM, NEVS has a set of different standardized BMs as starting points to launch from. As they serve these different segments with different needs, NEVS will implement a BM that has a standardized starting infrastructure and adapt the BM to the specific market needs overtime. Thus, allowing them to implement a standardized BM that can be synchronized with other BMs within the firm while simultaneously adhering to the local needs in a satisfying manner.

"We would not enter a market with a white paper but would have a couple of blueprints depending on the city and the power of the authority that is in control of the flow of transportation." - Roos (2020)

4.5.3 NEVS IoT Adaptations

4.5.3.1 Customer Blocks

When enquiring about NEVS customer segment, Roos (2020) revealed that due to IoT they are able to target a wide variety of customers ranging from private individual consumers to businesses and cities. Even though NEVS have a wide range of segments they are still able to create and maintain a close and more direct relationship with their customers due to the various connected platforms that they currently utilize. Roos (2020) stated that NEVS plan to pivot from the traditional car sales channels, to utilizing a mixture of IoT and non-IoT influenced channels. When selling their electric vehicles or physical mobility solutions they will develop and utilize their own showrooms where customers and clients can see the products and test them, as well as offer services through their apps.

"It will be important to have a close relationship with our consumers, we are witnessing this right now as a lot of our development relies on their direct feedback through the NEVS app." - Roos (2020)

4.5.3.2 Financial Flows

Due to their business core centering on IoT and connected products and services, NEVS will be able to utilize multiple revenue streams in their BM (Roos, 2020). As NEVS seek to target a broad range of customer segments they will adapt their BM and offer appropriate revenue models depending on what service or product they are providing, and to whom. A perfect example is the supply of their electric vehicles; this product will be both sold privately for

customers to own, and provided as a service to other customers that only want to use the vehicle. Since the electric vehicle will be utilized in different ways, NEVS will enable alternative methods for their customers to pay for the usage of their product (Ibid.). According to Roos (2020), the customers who want to privately own an electric vehicle will be able to purchase it through an asset sale or leasing. On the other hand, if NEVS has a customer that only wishes to temporarily utilize the product, NEVS will either charge them a usage fee or provide a subscription alternative. This adaptive revenue method will be applied throughout all of NEVS services and product offerings. Furthermore, NEVS will also seek to gain an additional revenue through advertisement as the cars will be personalized to the drivers and their preferences, the car will automatically make recommendations of areas for the driver to stop at in order to eat or shop (Roos, 2020).

"Looking at revenue, IoT is very central. If we were selling a car it has to be connected to something, otherwise no one would want it…. If you utilize a subscription based mobility service it is critical that the fleet is connected." - Roos (2020)

From the cost structure side Roos (2020) stated that overall NEVS sees them as having the same costs as any manufacturer and service provider, and the adaptations that NEVS has made in order to accommodate for IoT is embracing the required costs it takes to develop and produce connected electric vehicles and mobility solutions. Furthermore, due to NEVS being in the early stages of their life cycle they have decided to purchase necessary hardware and software that will enable them to create value. Having said that an adaptation that NEVS are able to enact due to having IoT enabled products is cutting down the maintenance cost of their products and creating a second life for them (Roos, 2020).

"There is nothing too crazy regarding our cost structure. When looking at it we are like a combination of a car manufacturer, OEM, and Uber." - Roos (2020)

4.5.3.3 Value Creation

Due to the small size of NEVS a key activity that they perform is evaluating their capabilities and assessing whether they should perform activities and product development in-house or purchase/outsource them (Roos, 2020). Another key activity that they perform is building their own software platform with the help of consultants and cloud service companies that assist in the creation process, as well as the maintenance of their cloud platforms (Ibid.). Roos

(2020) also stated that a key resource is having employees with the right knowledge and capabilities to develop the products and services. An additional key resource that NEVS highly prioritize is the ability to have an abundant amount of storage in the cloud, which enables them to keep track of all their data, processes, and allows them to be able to connect everything in the end. NEVS has a great number of key partners ranging from the various cities and public transportation groups that NEVS plan to provide their services and solutions to, and the suppliers of necessary hardware and software that NEVS need in order to succeed (Roos, 2020).

"We are a smaller company compared to Volvo or BMW and due to this we have to be selective regarding what activities we do in-house, and what we need to purchase/outsource" - Roos (2020)

4.5.3.4 Value Proposition

As NEVS is a rather young company, and have not fully implemented all of their planned operations into service, NEVS see that the future value that they plan to supply can be provided little by little every year (Roos, 2020). This value proposition also changes regarding which customer segment that they adhere to, but overall they seek to provide personal value to each customer segment through cars with steering wheel, self-driving cars, mobility systems with fleet management or back office support, customer interface, infrastructure interface, and mobility services such as car sharing services. Overall the value proposition that NEVS seek to provide in the future to all their customers is; convenience, predictive maintenance, next level of comfort and customization, safety, and usability (Ibid.).

"So there are several different customer segments where the needs differ but we will still take care of them. Our value proposition for now are cars with steering wheel, self-driving cars, mobility systems with fleet management or back office support, customer interface, infrastructure interface, and mobility services, but this might further develop and can become nearly anything in the future to support and type of mobility solutions in any form." - Roos (2020)

4.5.3.5 IoT Ecosystem

Due to the core business of NEVS relying heavily on IoT, they have already created a BM that can be adapted to an IoT ecosystem (Roos, 2020). Even though they have a BM that incorporates the existence of an IoT ecosystem, they have not fully developed one or partake in one, as currently one does not exist for them to join. The reason why there is no ecosystem for them to join is due to the fact that the products and services that they plan to provide in the future have not been fully developed. Currently NEVS is looking into developing IoT ecosystems in order to drive discussion and cooperation between them and relevant actors. In the beginning NEVS will look into developing multiple ecosystems that one-day can merge into a massive one, once regulations and technology that influences the IoT ecosystems have matured and fully developed (Ibid.). NEVS sees for example that IoT can create closer collaborations within the automotive industry as it can enable a unified database for different actors in the industry to access, to perform navigation tasks, and much more (Autopilot, 2019). However, in the end NEVS aims to be in as few IoT ecosystems as possible, with the requirement that the ecosystems that they want to be part of include a wide range of other actors, which allows NEVS to connect and truly provide the potential of their products and services worldwide (Roos, 2020).

"We are going to try to drive to be a part of as few systems as possible so there will be some standard platform…. I think we are out in the market early and because of this I will not say we will not build our own, there are a lot of actors out there and someone needs to drive discussion and take the initiative to persuade everyone else to work together…. There are going to be cities that we will provide complete solutions to and we will take the lead and use our platform." - Roos (2020)

Table 7: Summary of NEVS findings

NEVS	Adaptations made to BM	International Business Model
Customer Blocks	• Wide range of segments • Focus on segmented and niche markets • Stronger and more direct customer relationship • Co-creation • Utilization of app	• Early semi-global based BM • Increased standardization of BM • All BMs will connect to NEVS system • More accurate resource allocation
Financial Flows	• Offer appropriate revenue models depending service, product, and to who • Subscription • Asset sale • Usage fee • Leasing • Advertisement • Hardware costs • Software and cloud costs • Cutting down maintenance cost • Product development costs	**IoT Ecosystem** • Already have a BM adapted to an ecosystem • However there is no ecosystem to currently join • Will look to develop several ecosystems in order to drive discussion • End goal is to be in as few ecosystems as possible • The few ecosystems that they are members of should have a wide range of actors
Value Creation	• Assessing in-house vs. purchasing/outsourcing • Platform development • Software development • Collecting knowledge of customer • Employee capabilities • Employee knowledge • Software • Financial resources • Cloud storage • Various key partners • Hardware and software suppliers	
Value Proposition	• Convenience • Predictive maintanence • Customization • Comfort	

4.6 Qmatic

Qmatic was founded in 1981 when they developed the world's first electrical queue system. Since then Qmatic has become the global leader in customer journey management across 120 countries and provides customer experiences for more than 2 billion people every year. Even with such success their vision of leading and innovating customer journeys has remained the same (Qmatic, 2020a).

4.6.1 Qmatic Business Model

Qmatic has decided to implement two different types of BMs in order to provide customer journey management solutions, where one BM focuses on selling both software and hardware products through a one off revenue model, and the other BM is centered around the sell of only software solutions through a recurring revenue model (Dahlbäck, 2020). However, the

cost structure of the two BMs is that of a traditional product manufacturer (Ibid.). Qmatic has a broad and diverse customer segment where most of their clients are businesses within retail, finance, public service, and healthcare (Qmatic, 2020c). Even though they have a wide variety of customer segments, in terms of channels Qmatic has their own sales force that they use to sell directly to their clients, as well as a network of 3rd party distributors and retailers. When examining the customer relationships that Qmatic has, Qmatic distinguishes between the business that they sell to (*clients)*, and the end users that actually utilize their products (*customers)*. Qmatic also has a closer and more direct relationship with their clients than they do with their customers (Dahlbäck, 2020). Qmatic has an abundant amount of key partners that they utilize that range from the sales channels to suppliers and other companies that contribute to the development of Qmatic's platform and future software solutions (Ibid.). Due to these partnerships, some key activities that Qmatic perform are integrating actively their partners into current operations. Other key activities Qmatic also perform is constantly analyzing and predicting what their clients want. As a consequence of always analyzing and predicting their clients wants and needs Qmatic's key resources come in the form of IT and other relevant resources that contribute to their work (Ibid.).

4.6.2 Qmatic International Business Model

When asking about Qmatic's international BM they stated that they have a semi-global BM. The reasons why they deem their BM as a semi-global BM are due to multiple reasons, the past couple of years Qmatic has outsourced a number of activities such as warehouse storage and production that used to be done in Gothenburg to other sites throughout Europe and have operations in 5 continents (Dahlbäck, 2020). When examining the level of adaptation vs. standardization that Qmatic implements in their international BM it was revealed that over the past couple of years, Qmatic has gone from implementing a wide number of BMs that were region specific, to centralizing and standardizing majority of their operations into one global office, enabling Qmatic to focus even more on their core business (Ibid.). This change in level of standardization has led Qmatic to only needing to employ two types of BMs, making Qmatic's operations more streamlined and efficient compared to when they used dozens of BMs that performed identical tasks and consumed a large number or resources that could have been applied to something else. Furthermore, IoT has had a large impact on Qmatic's international BM as IoT has enabled Qmatic to collect and analyze specific regional data of

their clients, allowing Qmatic to provide individual solutions and new services to their clients worldwide (Ibid.).

4.6.3 Qmatic IoT Adaptations

4.6.3.1 Customer Blocks

Qmatic's implementation of IoT has created a shift in customer segments as the company has developed a stronger focus on larger clients. This shift has come about as Qmatic's larger clients gains more value from the additional services provided from IoT and data compared to smaller clients (Dahlbäck, 2020). The collected data will allow Qmatic to integrate further into their clients business, leading to a stronger customer relationship between Qmatic and its clients, as it will help Qmatic to develop insights and further increase the performance of the client. According to Dahlbäck (2020) IoT can help Qmatic gain more access to the clients, which has previously been fully controlled by partners in the past. As the partners sell Qmatic's cloud and IoT solutions, parts of the client ownership can be transferred to Qmatic.

"Shall we bypass them all together were the partner only works as a sales channel and we own the client relation during the life cycle or should we involve the partner so that they keep the customer relationship and we only provide data and develop services. It is a complex issue and we have yet to cross the finish line." - Dahlbäck (2020)

4.6.3.2 Financial Flows

New types of recurring revenue streams have been implemented as a result of Qmatic moving towards providing more software to its clients.

"During the last year and a half we have implemented a SaaS solution that enables the software to be bought on subscription basis" - Dahlbäck (2020)

In addition to subscription models, Qmatic has implemented renting and usage fees as additional revenue streams enabled by IoT in order to provide more possibilities for the clients and reduce the risk for the client of purchasing too much of the service at initial stages. According to Dahlbäck (2020) Qmatic's implementation of IoT will have both positive and negative impacts on the company's cost structure. In order to provide the services associated with IoT, Qmatic has to purchase services in relation to telecom and cloud services that was

previously not required. However, IoT will enable predictive maintenance, which will make it possible for Qmatic to coordinate their resources more efficiently and reduce personnel costs.

4.6.3.3 Value Creation

Since Qmatic has transformed their business over the past couple of years, the company has made a number of adaptations to their value creation blocks in order to generate value from IoT (Dahlbäck, 2020). When Dahlbäck (2020) discussed Qmatic's key partners, it was revealed that Qmatic has numerous partners that they rely on, and have recently begun to utilize solutions and software partners, who are tasked with further building or developing a platform and the complimentary services that Qmatic offers. Furthermore, Qmatic has also partnered with a number of companies that help them collect and store data, and consulting firms that specialize in data analytics and perform analysis of the data that Qmatic has acquired. Due to having such an abundant amount of partners, a key activity that Qmatic performs is integrating them efficiently into their business (Ibid.). Further key activities that were unveiled that Qmatic performs are further developing their software, constantly analyzing their operations and client offerings to ensure that they truly understand their clients and are able to properly serve them and provide them with relevant products and services, and making any necessary changes when applicable. Lastly when asked about key resources Dahlbäck (2020) emphasized the importance of having the correct employee capabilities and knowledge in order for the company to develop and deliver their IoT related services. Furthermore, the respondent stated that due to their operations handling data it has also become critical for Qmatic to ensure that they have the necessary legal competency within the firm to ensure that the company complies with laws and regulations.

4.6.3.4 Value Proposition

Qmatic is utilizing IoT to provide increased value for its clients. Providing the client with data is an important aspect of the value proposition and Qmatic is developing it by not just providing data generated by Qmatic but also by collecting and integrating data from other suppliers and partners in order to provide a more complete service to the client (Dahlbäck, 2020).

"We are developing an interesting initiative where we correlate our data with traffic and weather data, which is important within retail in order to provide more value to the client and insight to how they can optimize their business." - Dahlbäck (2020)

Qmatic is providing additional value to the client through providing cost-effective solutions (Qmatic, 2020b), and predictive maintenance of the hardware and software that is provided to the client in order to increase efficiency and usability of the products. As Qmatic is becoming more and more integrated into the business of its clients a continuation of the services provided by Qmatic becomes essential. To accommodate for this Qmatic provides escrow services for its clients in order to decrease the risk aspect for the client (Dahlbäck, 2020).

4.6.3.5 IoT Ecosystem

Qmatic sees them as currently being a part of an IoT ecosystem and believe that in the future it will be important for companies and other relevant actors to be a part of ecosystems. However, someone needs to take the responsibility and lead in creating said ecosystems (Dahlbäck, 2020). According to Dahlbäck (2020), Qmatic are currently seeking to take that central role and further develop an open platform that will allow actors that are associated with the platform to develop innovative and efficient solutions that will result in helping both Qmatic and the actors that are in the IoT ecosystem.

Table 8: Summary of Qmatic findings

Qmatic	• Niche markets	International Business Model
Customer Blocks	• Niche markets • Focus more on their larger clients • Stronger and more direct customer relationship • Become more integrated into customers business • Co-creation • Possibility of bypassing sales partner	• Semi-global based BM • Shifted towards more centralized and standardized operations • More accurate resource allocation
Financial Flows	• Shift from asset sale to recurring revenue • Subscription • Usage fees • Rent/leasing • Product development costs • Hardware costs • Software and cloud costs • Decrease in cost of personnel	**IoT Ecosystem** • Currently apart of an ecosystem • Pursuing to take a central role within platform • Develop an open platform to help develop innovative and efficient solutions
Value Creation	• Interacting and integrating partners • Platform development • Software development • Collecting knowledge of customer • Software • Employee capabilities • Employee knowledge • Legal competency • Data analysis consulting firms • Data collectors • Partnership with software developers	
Value Proposition	• Efficiency • Integrate supplier data into clients business to provide complete service to clients • Predictive maintenence • Provide escrow services to reduce risk	

4.7 Alten Group - IoT Expert

Alten Group is one of the world leaders in engineering and technology consulting and works with several different actors within aeronautics and space, security, automotive, rail, energy, life sciences, finance, retail, and telecommunications in over 25 countries (Alten, 2020). As a leading consulting firm their main product that they sell is their knowledge within engineering and technology (Rydell, 2020), and for this reason the authors agreed Alten would be an ideal firm to contact in regards to IoT and hear from their perspective what type of IoT impact and adaptations that firms can do.

4.7.1 Alten Group IoT Adaptations Observations

4.7.3.1 Customer Blocks

In order for companies to deliver value to their customers Rydell (2020) provided comments with what type of adaptations firms could do. For customer segment, Rydell (2020) has observed that every generation has a different consumer behavior, which will be affected by

IoT differently. Due to these differences it will become important for companies to develop and sell the proper products and services for the appropriate segments. By gaining a better picture of their customer segment companies will be able to develop these more specific products/services in order to reach their customer segment in new ways. Due to companies gaining this better and deeper understanding of a more specific segment, Rydell (2020) states that companies will gain a closer relationship with their end customers by automatically delivering personal solutions through the data that the company has gathered. Lastly, due to these more personal services and direct relationships that companies build with their customers, there will be large changes in the types of sales channels that companies utilize. As companies begin to sell more connected products and automated services, the traditional channels that have been previously used will not be able to accommodate for this. Instead of relying on retailers and other third parties to serve as channels, companies will be able to develop apps or app stores where customers can directly purchase the necessary product or service that they desire (Ibid.).

4.7.3.2 Financial Flows

Examining financial flows, Rydell (2020) discussed that companies will perform a number of adaptations in order to generate value through IoT. From the revenue side Rydell (2020) sees that companies will go from selling a physical product and relying solely on one time revenue, to focusing more on acquiring recurring revenue through subscription models. However, Rydell (2020) also believes that the revenue stream that companies will rely on will depend on if they are B2C, B2B, or B2G and what services or products the firm sells. Meaning that firms could stay with the traditional one time sale revenue model or could adapt to relying on crowdsourcing, subscription or other types of revenue streams that are enabled by IoT. From a cost structure perspective, Rydell (2020) stated that companies are likely to accept having very high development costs. They also see a rise in costs due to outsourcing of certain activities and purchasing the required hardware from other suppliers instead of developing it themselves, as well as high cost in adopting products to meet regulatory requirements.

4.7.3.3 Value Creation

Analyzing value creation, Rydell (2020) suggested that a key activity companies should do first is to find a user or segment that wants the product/service so the companies do not

develop a product that nobody wants. After that it is important to look internally and see if the firm should develop software and hardware in-house, or find a third party that can supply this (Ibid.). Examining key resources in an IoT oriented BM the proper software developers will be essential, as the physical product that the company sells will likely lose its significance in the future as it will not be constantly developed compared to the services connected to the product. Due to this it will become important for companies to educate their current employees and provide them with the tools and knowledge to develop new IoT solutions and create algorithms that will be able to efficiently and naturally learn from the collected data. Furthermore, financial resources can be important in cases where the company needs to develop hardware or acquire previous non-collected data. However, if another firm has already collected the data, financial resources will not be a key resource as data can be available quite cheaply (Ibid.). When it comes to key partnerships Rydell (2020) stated that companies would be more inclined in creating alliances or partnerships with other companies that provide specific hardware or software that will allow them to develop IoT enabled products.

4.7.3.4 Value Proposition

As companies will be able to collect data in new ways, they will also be able to analyze it in a contemporary fashion resulting in the acquirement of new types of data that they previously have never been able to obtain in the past. With this new data companies will be able to offer services and products that create an end value that is more convenient and usable to their customers and simplifies their daily lives (Rydell, 2020).

4.7.3.5 IoT Ecosystem

Rydell (2020) believes that when devices will be able to communicate between each other, firms will realize the importance of sharing data and creating an IoT ecosystem between each other in order to develop and perform new services. However, this also means that companies may be required to share sensitive data between each other, which will create a new challenge for firms to get past as traditionally that information would never be shared. Nevertheless, Rydell (2020) has seen companies attempt to work together and develop an IoT ecosystem and tackle this problem even though no ecosystem has fully been developed yet. Furthermore, Rydell (2020) also sees that IoT will have a significant impact on BMs and that companies will implement big changes to them in order to have more collaborations with other firms, and

provide a more developed value propositions together through this IoT ecosystem, compared to in the past where firms only had their own individual value proposition to give.

Table 9: Summary of Alten findings

Alten Group	IoT Adaptations Observations	International Business Model
Customer Blocks	• Retain current customer segments • Better understanding of customers • Reach segment in new ways • Stronger and more direct customer relationship • Possibility of bypassing sales partner • Utilization of app	• More accurate resource allocation **IoT Ecosystem** • Companies will realize the importance of creating an ecosystem in order to develop new products and services • Companies will begin to share sensitive data with one and another • Companies will develop value proposition together, rather than individually
Financial Flows	• Shift from asset sale to recurring revenue • Companies will accept having very high development costs • Hardware costs • Software and cloud costs • High cost in adopting products to meet regulatory requirements	
Value Creation	• Develop in-house vs. outsourcing/purchasing • Software development • Collecting knowledge of customer • Software • Employee capabilities • Employee knowledge • Financial resources • Partnerships with companies that provides IoT related hardware or software	
Value Proposition	• Increase convenience and usability	

4.8 Summary of Findings

The table below (Table 10) is a summary and displays the topics found in three or more of the cases and considered general findings of each company that has been examined throughout this study. The goal of this table is to quickly highlight some of the key adaptations that the studied companies have made to their BMs, as well as seeing how they changed their international BM and plan to accommodate for IoT ecosystems.

Table 10: Summary of Empirical Findings (created by authors)

BMC Building Block	IoT Adaptations	Volvo	Company A	Company B	Gunnebo	NEVS	Qmatic	Alten
Customer Blocks								
Customer Segment	Retain current customers	X	X	X	X			
Customer Relationship	Co-creation	X	X		X	X	X	X
	Increased personal service	X	X		X	X	X	X
	Further integrated into customers business	X		X	X		X	
Channels	Utilization of apps	X		X		X	X	X
	Possibility to bypass sales partners		X	X		X	X	X
Financial Flows								
Revenue Streams	Subscription fees	X	X	X	X	X	X	X
	Usage fees				X	X	X	X
	Lending/renting/leasing	X	X	X		X		X
Cost structure	Product development costs	X	X	X	X	X		X
	Software and cloud costs		X		X	X	X	X
Value Creation								
Key Activities	Platform development	X				X	X	
	Software development	X	X	X	X	X	X	X
	Collecting knowledge of customer	X	X		X	X	X	X
Key Resources	Software	X	X	X	X	X	X	X
	Employee capabilities	X	X	X	X	X	X	X
	Employee knowledge		X	X	X	X	X	X
	Financial resources			X		X		X
Key Partners	Software developers	X	X	X	X	X	X	X
	Collaborations with Startups	X	X	X				
Value Proposition								
Value Proposition	Convenience/Usability	X	X		X	X	X	X
	Performance	X	X		X	X	X	
	Cost reduction	X	X	X		X	X	
	Risk reduction	X		X	X	X	X	
	Possibility for updates	X	X	X	X	X	X	
Ecosystem								
Ecosystem	Aims to have a central role in ecosystem	X				X	X	
	Aims to find niche in an ecosystem		X		X	X		
	Aim to drive development in an ecosystem	X	X	X	X	X	X	
	Platform open for other companies	X	X	X	X	X	X	X
International BM								
International Business	Increased standardization of BM	X	X			X	X	
	More accurate resource allocation	X			X	X	X	X

5. Analysis & Discussion

This chapter seeks to compare and analyze the empirical findings with the theoretical framework presented in chapter 2. Furthermore, the chapter provides a structured analysis for the reader regarding the main adaptations identified and their effect on the companies.

5.1 Customer Blocks

5.1.1 Customer Segment

When analyzing customer segments, the authors identified both general and unique findings regarding the types of adaptations that the cases had implemented or planned to implement. A general finding that the authors uncovered were that Volvo, Company A, Company B, and Gunnebo had pivoted towards providing more IoT related products and services in order to retain their current customer segments. The companies agree with Evans (2011) belief that through IoT companies are able to collect critical data of their customers, which will allow the companies to gain better knowledge of what their customers truly want, leading to customer retention. The aspect of retaining current customers was not mentioned by Dijkman et al. (2015) and Metallo et al. (2018) and this could be due to a strong focus on the BMC, which does not emphasize customer retention. As most companies that will implement IoT, will do it within an already existing business and BM, the empirical evidence in this study indicates that it should be the main focus as they adapt their BM to IoT. However, the authors also uncovered a unique finding regarding Volvo and Company B. Even though the two companies aimed to retain their current customer segments, the authors have found that these companies will find new customer segments through gathering and selling data to customers not related to their core business. This indicates that IoT will enable companies to create a new type of categorization of customers as discussed by Osterwalder and Pigneur (2010) based on the customer needs of attaining data.

The study found that Company A, Company B, Gunnebo, NEVS, and Qmatic have begun to focus on identifying niche markets or a “segment of one” to target within their current customer segments. These general findings reinforce Dijkman et al. (2015) and Metallo et al. (2018) theory regarding customer segments, as there were changes in the type of focus

companies utilized to target markets. The companies stated that as IoT allows them to analyze their segments more thoroughly than before, they are able to perform a more refined analysis within their current customer segment and identify new individually tailored products and services to offer for the newly identified segment. By conducting a better analysis of the customer, companies are likely to also identify the customers that will bring the highest profits and will be able to maintain a stronger focus on those customers.

5.1.2 Customer Relationship

All the companies within this study performed adaptations towards their customer relationship block as a result of IoT. The adaptation made within the customer relationship block has mainly been driven by the retention of customers and to further boost sales towards current customers in line with Osterwalder and Pigneur (2010). The authors have found two general findings of adaptations that the companies have made within their BM that are aligned with the theories presented in the thesis, which are co-creation and increased personal service, as well as one finding that was not highlighted, which is further integration into the business of the customer. The finding that all companies but one (Company B) performs co-creation with its customers as a result of IoT is in line with Dijkman et al (2015) and Metallo et al (2018), who mentions it as an important aspect for companies when working with IoT. The companies can perform co-creation of new products and services in a number of ways depending on how they wish to interact with the customer.

Each company except Company B also indicated that they are able to provide more personal services to their customers as a result of IoT, which is also in line with what Dijkman et al (2015) and Metallo et al (2018) highlighted. The companies can deliver increased personal services mainly due to the data collected from the connected products and services that the customers utilize resulting in a more tailored value proposition for every customer. The authors found that four of the companies studied (Volvo, Company B, Gunnebo and Qmatic), which have a strong focus on B2B customers further develop personal services by integrating themselves into the operations of the customers. By integrating themselves further into the business of their customers, these companies can become a key partner in the value creation of their customers. This is likely to result in stronger customer relationships, allowing the companies to attain their goal of customer retention, as it will become more difficult and expensive for the customer to change to a competitor. Osterwalder and Pigneur (2010) argue that customer relationships can range from personal to automated, where the findings

concerning customer relationships point towards IoT increasing personal relationships between the companies studied and their customers.

When analyzing Company B, a unique finding that was not mentioned by Dijkman et al (2015) and Metallo et al (2018) was discovered as the company aims to create a stronger customer relationship through increased transparency of their operations for their customers. By providing more information and insights of the operations to the customer, Company B believes an increase of trust and a stronger relationship would be able to be built between them and their customers. This leads to Company B more clearly displaying what type of relationship they intend to keep with their customers in accordance with Osterwalder and Pigneur (2010). This case indicates that IoT can possibly affect the customer relationship block for companies not necessarily by creating new types of services, but by displaying current services and the operations of the company to the customer more clearly and efficiently.

5.1.3 Channels

From the cases studied in this thesis it is clear that the companies make adaptations to how they interact with their customers. Four of the companies studied (Company A, Company B, NEVS and Qmatic) as well as Alten see that through IoT, the companies will develop a closer connection and gain a better understanding of their final customer making current sales partners obsolete and leading to the potential of increasing profits and development of stronger customer relationship. Dijkman et al (2015) and Metallo et al (2018) find that sales force has an important role for companies adopting IoT into their business and when sales partners can be bypassed it is likely that the sales force will gain an increasingly important role within the company. Nevertheless, the extent that companies will choose to bypass the sales partners can vary between companies depending on the relationship with the partners and what functions they fulfill.

From this multiple case study, it was found that a majority of the companies (Volvo, Company B, NEVS, Qmatic) and the IoT expert emphasized the utilization of apps as a channel towards the customers. Alten believes that companies will move away from relying on retailers and third parties as sales channels, and instead develop apps to communicate directly with customers, whereas Dijkman et al (2015) and Metallo et al (2018) only highlight web sales as an important aspect of the channel building block. When analyzing the

companies the authors observed a trend among all companies in regards to the development and future utilization of apps as an additional channel, and believe that the apps could fulfill the five main functions of a channel that are described by Osterwalder and Pigneur (2010) while at the same time creating a high degree of access and flexibility for the customer. Companies utilize the apps in different ways, where NEVS app will have a very central role and is likely to be utilized to fulfill all the five functions of a channel in comparison to the other cases that uses that app only for one or a few of the functions. The authors believe that the importance of the app is likely to be connected to how companies utilize other channels as the older more established companies would use the app for fewer functions in the channel in comparison to NEVS. Since apps significance can increase in the future, it might be good to include apps in the channels block of a BMC as apps can be considered a more modern technological channel compared to websites.

5.2 Financial Flows

5.2.1 Revenue Stream

From the new types of services enabled by IoT, companies have made or plan on making adaptations to their revenue streams. With these new offerings, all the firms were able to provide more fitting and personalized pricing alternatives to their customers, shifting from relying heavily on one-time revenue, towards adapting recurring revenue models in their revenue stream block. From the study the adaptation of implementing subscription models was highly emphasized by all the companies, which is also in line with Dijkman et al. (2015) and Metallo et al. (2018). Even though there was an observable shift from reliance on revenue of one-time sales to recurring revenue, it was revealed that it would not be eliminated from their revenue stream. The companies will still offer the possibility of purchasing their products through a one-time pricing option, and include additional services to said product. How the companies charge for the included service alternated as Company A elected to offer a premium price on their products that included both the product and the services, whereas other companies may opt to sell their product individually and offer the possibility for their customers to subscribe for the additional services. It can be speculated that the shift towards recurring revenue is likely to result in a decrease of firm's sensitivity towards economic downturns and make the company more robust as the revenue stream will remain more constant in comparison to asset sale models if the company sees a general fall in demand within the industry.

When comparing the findings to the theoretical framework it was quickly revealed that the findings made throughout this study correlated strongly with what the consulted IoT expert (Alten) claimed, as well as what Dijkman et al. (2015) and Metallo et al. (2018) had identified as important revenue stream adaptations within an IoT BM. When analyzing Figure 3 that was presented in Part 2 of the thesis there is a clear indication that firms utilizing IoT products and services will begin to shift towards more recurring revenue, which the empirical findings supported. Furthermore, it was revealed that through IoT, companies were able to more accurately determine how much a customer segment is willing to pay for the value proposition that was offered by the company, which is an important aspect to know according to Zott and Amit (2010). All of the studied firms will be able to offer payment options that were based on the individual customer and ensured that the customer was paying for products and services in a convenient manner even if that meant the studied companies would not gain all of their revenue at once. The authors found that a number of the studied cases further utilized other recurring revenue models on top of the subscription-based models such as lending/renting/leasing options and usage fees.

Even though the authors uncovered a number of findings that correlated with the theoretical framework, they also discovered unique findings that did not align with the theories. When enquiring with NEVS regarding different types of revenue streams that they would utilize, NEVS revealed that they would seek additional revenue through advertisement. Another unique finding that the authors made when interviewing Company B is that due to their core business, Company B would be able to utilize pretty much any type of revenue stream in order to profit from their service. However, Company B would also be able to increase their current revenue model that they utilize, as with IoT enabled products Company B would be able to gain live data of the market that they operate in, and offer more accurately priced contracts that were truly reflective of current market conditions.

5.2.2 Cost Structure

From the implementation of IoT, the companies studied within this thesis experience changes in their cost structure. Osterwalder and Pigneur (2010) argue that the cost structure building block has different importance within the BM depending on the company's emphasis on cost minimization vs. value creation. According to Wortmann and Flüchter (2015), IoT is highly

associated with the value creation aspect of a BM, which indicates that the cost structure of the BM is not deemed as important in the sense of keeping costs to a bare minimum for companies who implement IoT in its business. This is further displayed by the companies within this study as all companies except Qmatic, highly emphasizes the increase in product development costs associated with IoT. Dijkman et al (2015) and Metallo et al (2018) further indicates that product development cost is the most important aspect of the costs structure for a company implementing IoT into its BM. Volvo has also taken a unique approach in its product development where the company has in addition to its in-house product development started a VC unit, which acquires startups that are implemented into the company and further increases the costs related to product development, this approach speeds up the development and could be seen as in line with the company's plan of gaining a first mover advantage. In addition to product development costs, most companies in this study (Company A, Gunnebo, NEVS, Qmatic and Alten) also mentioned software and cloud costs as the companies' utilized services provided by large technology firms. Even though cloud is an essential component of IoT solutions according to Porter and Heppelmann (2014), the cost of it is not mentioned specifically by Dijkman et al (2015) or Metallo et al (2018), nevertheless, the authors sees it as important adaptations to consider for the cost structure, as it provides a foundation for the implementation of IoT.

Gunnebo mentions cash flow as an interesting aspect that the company has to take into account due to the implementation of IoT and a shift to recurring revenue models. Gunnebo talks about "swallowing the fish" as they will maintain similar production costs while having to wait for the revenue that is postponed to the future to come in as the company shifts income from asset sales to recurring revenue. This is an issue not mentioned within theory, however, it is likely to be presented across different industries, as companies will gradually shift from upfront sales to recurring revenue. Gunnebo also sees a change in the cost structure related to cost of ownership as they no longer only have a one-time sale, but instead are responsible for the product in terms of maintenance and updates due to the recurring revenue model. Companies adopting the recurring revenue models are likely to face challenges in terms of cost of ownership and the amount of responsibility that they should take, and how to incorporate it correctly into the price of the product or service in accordance with Zott and Amit (2010). On the other hand some companies believed that with the implementation of IoT, they could experience an internal cost reduction in certain aspects of their operations indicating that IoT can have additional benefits on top of creating value for customers.

5.3 Value Creation

5.3.1 Key Activities

According to Wortmann and Flüchter (2015), value creation is at the core of IoT as new innovation characterized by a combination of physical and digital products leads to the creation of new products and BMs. The authors found that companies have adopted a number of new key activities to their BM in order to create and deliver new and improved values to their customer segments. The cases that the authors studied had made a number of similar changes to their key activities as Dijkman et al. (2015) and Metallo et al. (2018) had highlighted, with the primary activity all companies performing was software development. Volvo, NEVS, and Qmatic also mentioned platform development as a key activity within their BM. Moreover, the authors unveiled that another common activity that the companies performed was customer development, as they gathered essential information and knowledge of their customer that would help them further understand what new services and products they should develop. Company B on the other hand plans to take another approach in regards to the usage of the collected data, as instead of understanding the customer, Company B gathers necessary information in order to assess what internal equipment should become equipped with IoT services and where, which was an adaptation that was not highlighted in theory.

Alten mentioned the importance for companies to evaluate whether to perform certain value creation activities in-house or to outsource them. When interviewing Company B, NEVS, Gunnebo, and Qmatic it was revealed that all of these companies performed some form of internal assessment of their BM and decided to outsource a certain number of activities that they believed they did not have the internal capabilities to execute themselves, whereas Volvo and Company A elected to perform a large amount of their developments in-house and forego this internal assessment. The reason for these differences could be due to the different sizes and capabilities of the companies as Company A has the ability to industrialize new products quickly, or due to part of Volvo's approach of utilizing a first mover advantage and by developing in-house they will be able to implement this approach more efficiently. The assessment concerning in-house development vs. outsourcing is an activity not mentioned

within theory, however, the empirical evidence points towards the importance of this activity in regards to IoT.

The authors also uncovered additional key activities that were deemed essential, which were not highlighted by Dijkman et al. (2015) and Metallo et al. (2018). As the companies (Volvo, Company A and B, Gunnebo) stressed the importance of gathering customer knowledge, they also highlighted the importance of creating separate groups and divisions that would utilize the collected information and would drive the further development of IoT related products and services. Moreover, Company A and B emphasized that one of their key activities that they performed was communicating and persuading top management and the rest of the organization to ensure that all stakeholders would be invested in the development of IoT that were being implemented in order to ensure that any necessary key resources for the development of IoT does not get redistributed.

5.3.2 Key Resources

The findings regarding key resources strongly align with what was suggested by Dijkman et al (2015) and Metallo et al (2018). All firms mentioned that software and employee capabilities were the most important resources when implementing IoT into the business. This finding stresses the importance of having well developed software in relation to IoT and the importance of creating at least some aspects of the software in-house. Even if a copious amount of IoT related software can be purchased by a key partner, there is a need for each company to have the internal competencies to create and adapt the software based on their knowledge of the customer, product and industry in order to achieve a strong value proposition, and a sustained competitive advantage as suggested by Osterwalder and Pigneur (2010) and Barney (1991).

Financial resource was another general finding mentioned by two of the companies (Company B, NEVS) and Alten, which also fits with Dijkman et al (2015) and Metallo et al (2018) as it is found important, but not as important as the two previously mentioned aspects. The authors theorize that financial resources can be considered a key resource depending on which stage the company is in regards to the implementation of IoT. In the early stages of IoT implementation, which Company B and NEVS can be considered to be in, financial resources

are considered a key resource in contrast to the other four companies (Volvo, Company A, Gunnebo and Qmatic), who have come further in the implementation of IoT.

Qmatic highlighted an interesting key resource not mentioned within the theory in the importance of legal competency, especially regarding data. Since data is a key factor within IoT according to Porter and Heppelmann (2014) and plays an important part amongst all the companies studied, data ownership and being able to correctly comply with laws and regulations concerning data is likely to be important aspects in value creation and risk mitigation for companies outside this study. Additionally, having the right legal competencies within the company could become a key resource for many firms as a result of IoT, as IoT ecosystems are likely to continue evolving and become increasingly important. The right legal competencies can further be emphasized as a key resource, especially if competitors become more involved in the ecosystem to reduce the risks associated with partner opportunism.

5.3.3 Key Partners

The acquisition of essential resources and activities as suggested by Osterwalder and Pigneur, (2010) lies as the main reason for all the company's adaptation of key partners in relation to IoT. Software developers have become crucial key partners for all the studied companies as they deliver necessary functions that enable IoT, which aligns with the findings of Dijkman et al (2015) and Metallo et al (2018). Furthermore, the authors found that Volvo, Company A and B sees collaboration with startups as important, especially within the development of software.

The usage of external data analysis companies suggested by Dijkman et al (2015) and Metallo et al (2018) were found only in the case of Qmatic as a key partner and one likely explanation is in regards to company size, where Qmatic is the smallest and may lack the necessary resources compared to the other companies. None of the companies, however, mentioned launching customers partners as important or affecting the BM, which indicates that the importance of this aspect may not be as important as deemed by Dijkman et al (2015) and Metallo et al (2018) in regards to MNCs.

The implementation of IoT has further led to stronger connections with new types of partners and stakeholders that were not previously considered important. This can be seen within

Company B and NEVS, which believe that IoT will lead to stronger relationships with governmental/environmental organizations that will not necessarily be used as a source of income, but can lead to increased efficiency and goodwill for the company. Gunnebo is another example as the company has been able to evolve current partnerships with suppliers, into also becoming sales channels. These findings indicate the increased importance of an IoT ecosystem discussed by Westerlund et al. (2014) who highlights that as companies become more connected with their partners, the different blocks within the BMC could begin to merge together. Due to this, when implementing IoT there may be a need for companies to maintain an open mindset when interacting with partners. As with an open mindedness and sharing the generated data, new opportunities for value creation would emerge as IoT enables companies to develop new value with partners that were not initially considered essential, resulting in past non-essential partners evolving into key partners.

5.4 Value Proposition

Keeping the argument that value creation is at the core of IoT (Wortmann and Flüchter, 2015) in mind, after analyzing the empirical findings it was revealed that this argument was true and that all of the companies that were studied in this thesis had improved their value creation segments, leading to the companies experiencing changes to their value proposition due to IoT. A possible reason as to why these experiences can be accredited to IoT is because it has allowed firms to shift from relying on generating value from just individual products, to being able to generate multiple values for their customers through new IoT enabled services and products, which correlates with the argument of Porter and Heppelmann (2014) who argues that the value of a product may be further enhanced if the product becomes connected to related products as a part of a product network. In this study, this shift was exemplified by Volvo, Company A, Gunnebo, and Qmatic, as they unveiled that their traditional approach, where they would rely significantly on only delivering value through manufactured products, had begun to change as they had started to provide a new value to their customers by offering additional services to the products that they manufacture. There were multiple new deliverable values that would emerge from these new products and services that the companies highlighted that aligned with the value propositions that were discussed by Osterwalder and Pigneur (2010), Dijkman et al (2015) and Metallo et al (2018). The findings of this study emphasizes the importance of the following six aspects mentioned within theory;

increase in performance, efficiency, convenience, possibility for updates, accessibility and cost reduction.

Examining how the companies would deliver these values it was revealed that through IoT the companies would seek to integrate deeper into their customers businesses and value chains than ever before, making them a crucial piece for the future success of their customers. By becoming more integrated, the studied companies would be able to serve their customers in a whole new way and provide new products and solutions that not only increase the performance of their customers, but also help keep track of the conditions of the delivered products and offer the possibility of predictive maintenance and quick and convenient updates of them, resulting in products not malfunctioning in inconvenient times or causing extra costs to incur. These type of benefits were highlighted as some of the most important value propositions to provide in a company's IoT BM according to Dijkman et al. (2015) and Metallo et al. (2018), and through this study it seems that companies follow suit. However, the integration into a customers business does not only benefit the customer, but could also benefit the companies as well. Since the companies will become such an influential cog in the operations of their customers, it would become increasingly difficult for their customers to change to competitors as this transfer could result in high costs and a decline in performance.

From the multiple case study the authors also found that through IoT companies will be able to further mitigate risk for their customers, which is an aspect of the value proposition that Dijkman et al. (2015) and Metallo et al. (2018) did not consider important. Additionally, the authors found that IoT will enable companies to provide methods of payment that mirror the customer's revenue model as well as transferring more risks from the customers to themselves through the new revenue models. The new IoT enabled revenue models are likely to provide value for the customer in terms of lower investments and commitment when initially purchasing a product or service, resulting in a more positive cash flow for the customer. The effects of the new revenue streams on the value proposition have not been mentioned within theory but could possibly stand as a reason for or why one customer turns to a specific company to solves a problem as mentioned by (Clauss, 2017).

When comparing the findings with what was presented in the theoretical framework it was quickly revealed that Teece's (2010) and Clauss's (2017) arguments that value proposition within a firm consists of solving a problem or satisfy a need inhabited by a targeted customer

segment by providing a bundle of goods and services, which will create value for the targeted customer segment rings true. Throughout the study when asking what the companies' value propositions were and how they changed, all the individuals that were interviewed discussed the importance of understanding what their customers really want and need, and then circling back to the products and services that they offer and how they would be able to refine them more thoroughly to the targeted customer segments needs. The strong focus on the new value offered to the customers through IoT supports the findings by Dijkman et al. (2015) and Metallo et al. (2018) that the value proposition block stands as the most important building block within the BMC in relation to an IoT BM.

5.5 IoT Ecosystem

When analyzing the empirical findings it was quickly revealed that all of the studied cases had begun to consider an IoT ecosystem, as they believed that in the future it would be critical for companies to be apart of ecosystems in order to maintain success. The reason why they believe this is because they predict that innovation, and value that is associated with IoT will develop through an ecosystem environment that consists of a wide variety of actors working with one and another, this belief correlates with the argument of Klein et al. (2017) who stated that in order to fully generate value from IoT, there could be a need for firms to consider the IoT ecosystem. For this reason Volvo, Company A, Gunnebo, and Qmatic had gotten involved in IoT ecosystems and currently identify as being apart of them, while Company B and NEVS were still searching for ecosystems that would be beneficial and attractive for them to join. This belief that the companies have regarding the necessity to join IoT ecosystems also aligns with the argument of Porter and Heppelmann (2014), who stated that value may be further enhanced if a product becomes connected to related products as part of a product network, as well as Alten's recommendation that in order for firms to develop and perform new services they need to create an IoT ecosystem where they share information with each other and create value propositions together, rather than individually.

Discussing further regarding the creation of IoT ecosystems, it was also revealed that each company are currently creating internal ecosystems in order to further cultivate a discussion and development of a more general and open ecosystem for anybody to join. However, not all firms had the same idea of what the future outcome of their IoT ecosystem would be. Company A, Company B, and Gunnebo all stated that even though they were developing an

internal IoT ecosystem, they were doing that with the end idea of being able to connect their self developed ecosystem to a consortium or someone else's ecosystem and establish a niche role within that IoT ecosystem. Volvo, NEVS, and Qmatic on the other hand wanted to develop open IoT ecosystems where they have a central role within them and act as a platform provider where they are responsible for the maintenance and development of the IoT ecosystems. These findings indicate that companies have different goals and ambitions within the ecosystems, most likely depending on the size and the products and services in which they offer. This is a finding not mentioned within theory but stresses the importance of managers in choosing the role within an IoT ecosystem that results in the highest benefits for the company at hand.

A finding made regarding how the companies prepare for an IoT ecosystem is that the companies all supported the theoretical idea of creating or being apart of an ecosystem that has an open platform that allows other companies to easily join and contribute. However, this openness could lead to some challenges that Alten and Westerlund et al. (2014) pointed out. With an open IoT ecosystem it will become important to share data and information in order to develop and perform the new services, leading to companies perhaps being required to share more sensitive data between each other, that in the past would never have been shared. In order to accommodate for this Alten believed that companies would need to change their BMs in order to enable these collaborations with other firms. This belief is aligned with Westerlund et al. (2014) arguments that traditional BM designs are not sufficient enough within the context of IoT ecosystem and instead of designing BMs through singular blocks, firms should focus on connecting different parts of their BM and create a focus on the flows and actions of different portions within a BM. Metallo et al. (2018) further added to Westerlund et al. (2014) argument that this change would also help connect the external environment that firm operates in with the BM design that supports value creation and capture. When asked about these new ways of designing BMs all companies believed that in the future this would be important, however they also stated that as of now none of their IoT ecosystems that they are apart of have developed that far where this approach is relevant as of yet. This finding indicates that there is no strong empirical evidence within this multiple case study that supports companies incorporates the value design theory developed by Westerlund et al. (2014)

A potential reason for this lack in development could be due to the absence of collaborations with competitors. As the true value of IoT ecosystems is believed to derive from collaboration between companies within the same industry as they share knowledge and information between each other. Companies are more likely to be hesitant to do this, as there is a risk of losing sensitive information that can benefit a competitor, resulting in a focus on internal IoT ecosystems and collaborations with partners in other industries.

5.6 International Business Models.

The companies presented in this study were mainly considered to have semi-global BMs as production and sales are conducted in several different countries in line with the definition created by Rask (2014). Even though interviewees stated that IoT has had or will have an impact on their companies international BM, the authors did not identify any significant changes in them with regards to the typology of the international BM. However, NEVS could be considered being in the early stage of a semi-global BM as the company is relatively young and would fit more in line with Child et al. (2017) and their definition of technology exploiter. The authors have found that the implementation of IoT may ease the conundrum of standardization vs. adaptation of the international BM discussed by Tallman (2014). Four of the cases (Volvo, Company A, NEVS and Qmatic) suggested an increase in standardization of their international BM as they can utilize data to maintain a similar BM across markets and instead deliver adaptation on an individual level through the use of data. The data will enable the companies to learn the needs and behaviors of the customers and be able to automatically formulate an offer to the customer that is in line with its needs and preferences, regardless of the market the customer is located in. This has the possibility of limiting the needs of developing BMs for every market that the company decides to enter and in a standard and systematic way use the collected data to create automatic individual adaptations rather than general market adaptations.

A second finding in regard to adaptations to the international BM as a result of IoT, mentioned by Volvo, Gunnebo, NEVS, Qmatic and Alten is an increased efficiency of resource allocation between the markets. Wortmann and Flüchter (2015) state that due to IoT, devices that has primarily produced a physical function which had only been able to be utilized on a local level can now be used on a global level due to these additional services. An example of how companies are able to benefit from this transformation is exemplified by Gunnebo who is able to use IoT to centralize service and support functions in relations to their

products as they no longer need to be physically present within the market in which they are operating but can instead perform these services from a remote location. These findings are also in line with Rask (2014) as these companies have a semi-global BM as they locate their activities where the best cost/value ratio is found as well as coordination as the companies integrate IoT as a new value chain activity that enables a higher profit by limiting the costs associated with the company's subsidiaries. The increased efficiency within resource allocation further supports the evidence of an increased standardization of the international BM as activities within the companies have been centralized and standardized as a response to the emergence of IoT.

6. Conclusion

This chapter will initially answer the presented research question and display the main conclusions, which calls for revision of the analysis tool displayed in chapter 2. The implications and contributions of this thesis are then presented and discussed to address the purpose of the study. To conclude, the contributions and limitations of the study as well as suggestions for further research are presented.

6.1 Answering the research question

As past research has focused more on the technological aspects of IoT, rather than investigating thoroughly how to incorporate IoT into a BM (Leminen et al., 2011; Díaz-Díaz et al., 2017; Klein et al., 2017), the authors at the start of this thesis set out to collect and contribute evidence that would provide empirical support to academic literature of how businesses incorporate IoT into their BM. Upon further investigation the authors realized that there was a lack of research on international BMs, how IoT impacts international BMs of companies, and what adaptations companies make to their international BM. Leading to the purpose of this thesis being to provide increased knowledge of international BM and IoT, as well as supply empirical evidence of how multinational corporations adapt their BM to accommodate for IoT. With this purpose the authors formulated the research question: *What adaptations do MNCs implement to their international business model in order to generate value through IoT?* Through a multiple-case study of 6 companies, and the consultation of an IoT expert, the authors were able to collect significant findings to conduct a critical analysis through their self-created IoT-adapted BMC (InoT BMC) in order to answer this research question. The authors uncovered a number of main adaptations that MNCs implemented to generate value from IoT, which are presented in Table 11.

Table 11: Revised InoT BMC

	BMC Building Blocks	Key Adaptations from IoT	
Customer Blocks	Customer Segment	• Retain current customers • Niche market	**International Business Model**
	Customer Relationship	• Co-creation • Increased personal assistance • Integration into customers business	• Maintain semi-global BM • Standardization of international BM • Increased efficency within resource allocation within the international BM
	Channels	• Possibility of bypassing sales partners • Interaction through app	**IoT Ecosystem**
Financial Flows	Revenue Streams	• Subscription fees • Premium asset sale • Usage fees • Leanding / renting / leasing	• Companies seek to be apart of an ecosystem • Companies has adopted BM to internal ecosystem instead of a vasst external one • Difference in desired role within ecosystem • Companies belive that future IoT related value proposition will emerge through ecosystem • Companies has adopted BM to internal ecosystem instead of a vasst external
	Cost Structure	• Product development costs • Software and cloud costs • Personnel costs	
Value Creation	Key Activities	• Product development • Software development • Customer development • Creating a IoT related division • Assesing in-house development vs. outsourcing	
	Key Resources	• Software • Financial resources • Employee capabilities • Employee knowledge • Legal capabilities	
	Key Partnerships	• Software developers • Collaborations with smaller hardware and software businesses and startups • New types of partners in other industries	
	Value Proposition	• Convienience / usability • Performance • Possibility for updates • Price convinient to customer • Cost reduction • Customization • Accessibility • Risk reduction	

The authors have concluded that making adaptations to the *Value Creation* blocks are considered important by companies in order to deliver a strong *Value Proposition*, which is the most critical block within an IoT BMC as argued by Dijkman et al. (2015) and Metallo et al. (2018). However, the authors have also established that there are additional crucial

adaptations that firms need to implement in their BM in order to truly generate value through IoT, which are *Customer Relationship, Revenue Streams*, and ensuring that the company is ready to join an IoT ecosystem in the near distant future. Furthermore, the authors discovered that IoT has an effect on a firm's international BM as it leads to an increased standardization of the company's international operations.

6.1.1 Customer Blocks

This study displays that the incorporation of IoT will result in an increased focus and deepening of the relationship firms have with their current customers, which aligns with the adaptations that Dijkman et al (2015) and Metallo et al (2018) presented in their theories. IoT will enable companies to develop more personal relationships with their customers by integrating themselves into the operations and value chains of their customers and co-creating projects. By deepening the customer relationship, companies will be able to provide more tailored solutions that create a competitive advantage towards competitors and making it difficult for the customer to replace the company, especially in a B2B relationship. Through this study the authors also identified new types of adaptations within the channels block that had not previously been mentioned by Dijkman et al (2015) or Metallo et al (2018). As IoT will enable companies to gain a more direct channel towards their final customers, they will also gain the possibility to bypass sales partners and have the ability to develop deeper customer relationships and increase profits.

6.1.2 Financial Flows

This thesis displays that firms have begun to shift from relying heavily on one-time revenue, to adapting different forms of recurring revenue in their BM as a result of IoT. Companies are able to provide flexible and more personalized pricing alternatives to their customers, resulting in lower upfront cost alternatives more fitting for their customer, as well as empowering their customers to decide what products and services that they truly want. The increased personal pricing alternatives can give companies a competitive advantage over their competitors and lead to customers selecting them over a rival company. In regards to cost structure, companies will adapt to an increase in current costs, especially within product, software, and cloud development. These increased costs is seen as a necessity and something that the companies are willing to embrace in order to further develop their products and services to maintain their competitiveness. However, with the gradual shift from upfront sales

to recurring revenue, companies will have to begin to account for a change in the cost structure related to the cost of ownership and a negative impact on cash flow. The cost of ownerships and impact on cash flow are aspects not mentioned by Dijkman et al. (2015) or Metallo et al. (2018). However, they are important aspects for managers to consider as they likely to result from the implementation of IoT in to the BM.

6.1.3 Value Creation

In order for a company to create and deliver new and improved value to their customers through IoT, companies have to implement a number of adaptations to their key activities, resources, and partners. This study provides empirical evidence for three of the main aspects highlighted by Dijkman et al. (2015) and Metallo et al. (2018), being software, product, and customer development. However, companies also performed two key activities that were not mentioned within the theory that the authors believed were influential to a company's success. These two aspects were the creation of separate groups and divisions whose purpose was to utilize the collected data and develop future products and services that are demanded and fit the needs of their targeted customers. As well as performing an internal analysis of their resources and capabilities in order to decide if it is more beneficial to perform certain activities in-house or to outsource them.

The empirical evidence further indicates that having the right software and employee capabilities are essential in the value creation process. While much of the software can be purchased from partners, the authors found that there is a need for companies to have in-house employee capabilities and knowledge concerning the industry, the company's customer, and the product in order to provide software that creates substantial value for the customer. Moreover, the authors abduced an intriguing potential key resource that was not mentioned by the majority of the companies, as well as the theories presented by Dijkman et al. (2015), Metallo et al. (2018), Westerlund et al. (2014) and Klein et al. (2017), which is legal competency. As the importance of IoT ecosystems is estimated to grow in the future, the authors believe that it can be increasingly crucial for companies to have proper legal competency regarding IoT ecosystems and the handling of the collected data in order to mitigate risk and deter any form of opportunism that can arise. Furthermore, companies acquire key resources from partnerships with most importantly software developers but also

with new businesses in completely different industries, which they traditionally would not partner up with.

6.1.4 Value Proposition

Creating value is at the core of IoT and delivering value in the form of new products and services stands as an important aspect for all companies viewed in this study. The empirical findings in this study further supports the theories laid out by Dijkman et al. (2015) and Metallo et al. (2018) in relation to some of the main aspect within the value proposition block that results from IoT such as increased performance, efficiency and convenience. In addition to providing empirical evidence to the theory, this thesis highlights two aspects not considered important within theory, which are mitigating risks and the value provided to the customer through tailored revenue streams. The findings in the study and the theoretical framework e.g. Dijkman et al. (2015) or Metallo et al. (2018) emphasizes the importance of the value proposition block in relation to IoT as the new products and services can create an astonishing amount of new value for the customers. Indicating that there is a need for firms to implement IoT into their business in order to secure future competitiveness.

6.1.5 IoT Ecosystems

To conclude the findings made related to how companies accommodate and adapt for the creation of IoT ecosystems it was revealed that all cases agreed with Westerlund et al. (2014), which claims that businesses will have to alter their models to acclimate for ecosystems, as well as believing that ecosystems will have a crucial role in how companies create value in the future. Even though companies have this belief, it was discovered that majority of the companies have currently not made any changes to their BM in order to consider collaborations with competitors or any joint development of vast IoT ecosystems within their industry. Instead they have elected to develop internal ecosystems to drive discussion of the creation of vast IoT ecosystems within the industry. Furthermore, this study indicates that a company's role within an IoT ecosystem can vary between firms, creating a need for managers to identify the optimal role for the company after an analysis of the competitors and the potential partners within the ecosystem.

6.1.6 International Business Model

While the impact of IoT on international BM of a MNC has not been considered within the theories presented by Cao et al. (2018), Rask (2014), and Tallman (2014), the authors found that the international BM can be affected by IoT in two different ways. Firstly, due to IoT a tendency towards an increased standardization of the international BM was identified. Companies will be able to provide adaptations on an individual customer level instead of general market adaptations through the use of data gathered from the local customers, without sacrificing the company's global strategies and the need for BMs to be integrated with other regional or worldwide BMs. This will reduce the need for managers to formulate BMs for every market and easing the conundrum of adaptation vs. standardization of the international BM that companies tend to face in its international operations. Secondly, firms are able to conduct more efficient resource allocation due to IoT, as functions and services could be centralized and conducted remotely, allowing for an increased coordination of the international BM and lower costs associated with the company's subsidiaries. The findings of more efficient resource allocation further supports the tendency of IoT enabling companies to standardize their international BM without needing to fully sacrifice local adaptation, as well as enabling MNCs to more fluidly communicate and coordinate operations with their subsidiaries and global offices.

6.2 Contributions and Implications

In this thesis the authors have contributed to the lack of research that exists on how to incorporate IoT into a BM, as well as its impact on an international BM. This thesis provides more empirical evidence to ease the research gaps identified within IoT and BMs, further strengthening the theories that were laid out in the theoretical framework, as well as identifying and contributing new aspects that the theory did not consider in the past. The authors have further evolved the BMC into an analysis tool for studying IoT and international BMs, which can be beneficial from a research perspective, as it can be utilized, and further developed in the future by researchers. This thesis has also bridged the gap between value creation through IoT BMs and IoT ecosystems, which has in previous research been separated and there has been a focus on one or the other. Furthermore, this thesis has contributed an additional dimension to research topics regarding IoT and international BMs by combining the two topics, which is a research field that seems rather overlooked at the moment. The authors have displayed that IoT can affect the way MNCs operate and this thesis can give

managers an understanding and the ability to find more efficient solutions in the way they manage the international operations of a firm.

The implications that this thesis has provided are the main adaptations that MNCs implement to their international BM in order to accommodate and generate value through IoT. Thanks to this study from a managerial perspective the creation of future strategies and decisions taken regarding IoT can become less complicated since recommendations on what main adaptations that companies should adopt have been identified, as there was a lack of knowledge concerning the impact of IoT from a business perspective. Furthermore, this thesis has lead to the creation of a new analysis tool, InoT BMC, which allows companies and managers to gain a better overview of their current BM, as well as further developing IoT-adapted BMs through the BMC, while simultaneously incorporating ecosystems and the international BM perspective. Lastly, this thesis also highlights the growing importance of creating and changing BMs to incorporate IoT ecosystems, as well as identifying a need for companies to change their current IoT ecosystem development design consisting of creating one internally, to seeking external joint development of IoT ecosystems with competitors.

6.3 Limitations and suggestions for future research

Since this thesis only uncovered what adaptations MNCs in Sweden implement in order to generate value through IoT. The authors suggests for future research that similar studies are conducted with a focus on SMEs as it is likely that they have different capabilities or MNCs from different nations or regions, as there could be geographical, cultural, and political factors that influence the development and adaptation of the BM due to IoT. Throughout the study the authors identified potential differences between industries concerning how the companies generate value through IoT and future researchers can potentially gain further insights by focusing studies towards certain industries. The findings and the analysis tool presented in this thesis can be considered useful in future research more focused on the adaptations made within specific industries.

The authors also want to emphasize the need for researchers to conduct more studies in regard to international BM literature and IoT ecosystems. Throughout the study the authors identified an underdevelopment within international BM research in comparison to the other topics that the authors discussed throughout their theoretical framework. As mentioned in the

background portion of this thesis, the trend of companies expanding their international presence does not show any sign of reversing and the authors believe it is important to gain more knowledge regarding how to design BMs that incorporate the dynamic complexity of being international, rather than relying on BM design tools that are opted for companies in a domestic environment. Lastly, to fully understand the workings within IoT ecosystems and how companies can develop them, the authors call for more research into the field of IoT ecosystems, as this is a topic highly emphasized by managers but in very early stages of its development. Future research could provide more empirical evidence and further suggestions on its impact on BMs and how companies can efficiently create IoT ecosystems.

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Appendices

Appendix A

Appendix A: The IoT generations, technological fields that influenced the generations and their major objectives. (Source: Xiangxuan, 2017)

Generation	**Technological Fields**	**Major Objectives**
Gen I: The Tagged Things	Tagged Objects	To uniquely identify objects through appropriate naming and architecture for the retrieval of objects' associated information
	Machine-to-Machine	To define a reference architecture for machine-to-machine communications
Gen II: Full Interconnection of Things and the Social Web of Things	Integration RFID with WSN	To seamless combine data coming from RFID tags with data generated by sensors connected through WSNs
	Internetworking	To allow constrained devices to adopt the TCP/IP protocols for a seamless integration in the Internet
	Web of Things	To allow constrained devices to take part to web communications
	Social Network Services	To allow people to share data generated by their smart objects with people they know and trust, leveraging the existing human social networks services
Gen III: Age of Social Objects, Cloud Computing, and Future Internet	Social Internet of Things	To make objects able to participate in communities of objects, to create groups of interest, and to take collaborative actions with the objective to facilitate service and information discovery
	Semantic	To describe the features of the IoT objects to foster systems interoperability

	Future Internet	To introduce the Information Centric Networking feature into the IoT world so as to introduce content centric-driven rather than host-driven communications
	Cloud	To empower objects with storage, communications and processing capabilities coming from the cloud
	Evolved RFID-IoT Integration	To facilitate the integration of the RFIDs into the IoT applications

Appendix B

Appendix B: Example of initial Email sent to companies (Similar Email was sent in Swedish to Swedish participants).

Hello XX,

My name is XX and I am a student at the Gothenburg School of Business, Economics, and Law who is currently writing a master thesis with XX regarding how companies adapt their current business models to capture the value of IoT. We are currently searching for companies that are willing to partake in our study as we seek to collect information through interviews regarding the procedures and actions that XX COMPANY takes when adapting their business models to IoT.

If you are not able to participate in our study we would greatly appreciate any information of whom we should contact instead regarding our thesis.

You are more than welcome to contact us by phone or mail.

Thank you so much for your help,
Nichlas Willenborg and Oscar Mölne

Appendix C

Appendix C: Interview guide

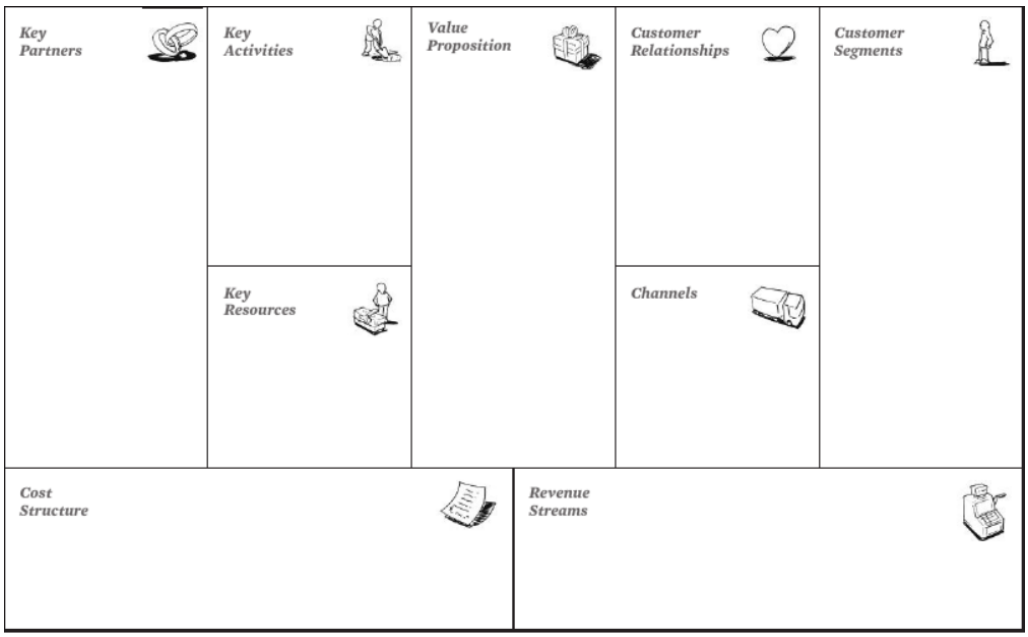
Background

1. Name, role in the company?

2. What is your experience in working with IoT?

Business model understanding

1. What is your business model? How does it look like?



Please consider this business model design

2. In regards to international BM theory, what BM typology do you consider the company to currently possess?

1. Domestic-Based Business model
2. Import-based business model
3. Export-based business model
4. Semi-global business model

3. Does the company possess one or more business models?

Impact of IoT on business models

1. Does IoT impact your international business model?

2. Impact of the IoT on current business model, how will the IoT transform the:

a. Customer segment

b. Value proposition

c. Cost structure

d. Customer Relationships

e. Revenue streams

f. Key activities

g. Key resources

h. Key partners

i. Channels

3. Does IoT effect the standardization and adaptation of the BM?

4. What are some difficulties that you believe can occur when adapting current BM to IoT?

5. Do you consider being a part of an IoT ecosystem?

6. Do you see a larger focus on the flows and actions of the different BM blocks, and have any segments of the business model become more connected with one another compared to prior business models?

7. Has these changes made it easier to capture the value of IoT?