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Master Degree Project in Innovation and Industrial Management

Time for a New View?

The view on firm boundaries within the context of IoT

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Abstract

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Title: Time for a new view? The view on firm boundaries within the context of IoT.

Background and problem: Transformation driven by Internet-of-things (‘IoT’) is dramatically changing the prerequisites for business strategy and competition. The decision on what to make-or-buy, i.e. where to put firm boundaries, is being reviewed as a result. Existing, grounded theories on firm boundaries; *the transaction-cost-economics, the resource-based view and collaborative view(s)*, stem from a time of more stability than the dynamic environment IoT creates. Hence, it becomes questionable whether firms can base their make-or-buy decisions in such theories today, when set in the context of IoT.

Purpose: The purpose of this study is to investigate how well existing theories can explain firm boundaries within the context of IoT, or if new or modified explanations are needed. The purpose will be fulfilled through answering the following research question: *How well can traditional theories on firm boundaries explain how firms view their boundaries within the context of IoT-driven transformation?*

Method: The explorative purpose of this study will be fulfilled through a qualitative research strategy, with a cross-industry, multiple case-study design, based on semi-structured interviews with seven large, established companies. The sample includes Swedish companies that were selected based on their size, maturity and industry.

Research implications: The study presents the existing firm boundary theories lack of explanatory power when set in the context of IoT. The collaborative view(s), where increased emphasis is put on the firm ecosystem, has proven the most helpful, but with some modifications needed. In addition, the results have given indications toward a new theory on firm boundaries and a push toward further research in the area.

Practical implications: First, companies are recommended to establish a questioning attitude toward their previous focus (core) and challenge their previous view on boundaries as well as industrial boundaries when set in the context of IoT. Companies should take a more outside-in approach, where external actors are viewed as a source of competitive advantage and considered to a greater extent within make-or-buy decisions when trying out new IoT-related solutions.

Key words: Make-or-buy decisions, Firm Boundaries, Internet-of-things

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Abbreviations

IoT	Internet-of-things
RBV	Resource-based view
TCE	Transaction-cost-economics
VGT	Volvo Group Telematics

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1. Introduction

The introduction introduces the reader to the research question and provides background on concepts that will follow throughout the thesis, such as IoT, firm boundaries and make-or-buy decisions. The scope, purpose and limitations will be discussed and finally a disposition of the complete study is outlined.

1.1 Background

The foundations of traditional business practice and research are exceedingly challenged in today's globalized and knowledge-based society (Heracleous, 2003; Afuah, 2009), or what Ericsson (2015) refers to as the "Networked Society". The new reality is in part the result of IT-driven transformation which includes advances in Information Technology ('IT') that enable different, more efficient ways of doing business (Porter & Heppelmann, 2014). According to Ericsson (2015), the organizations that will be rewarded in the digital industry age are the ones who have the data, the tools and the skills to make use of not only the technology, but the also the knowledge available to them.

IT-driven transformation has showed two major cycles of impact on business the past 50 years (Porter & Heppelmann, 2014). First in the 1960's, when products for a long time had been mechanical and activities in the value chain performed based on manual processes using verbal communication. Advances in IT enabled automation of activities in the firm value chain, from order processing to computer-aided design and manufacturing resource planning. Productivity was enhanced, and eventually led to the standardization of manufacturing, raising a dilemma for firms who previously had been industry leaders through distinctive manufacturing processes. In the 1980's, the second wave of IT-driven transformation, dubbed Internet, rose with its inexpensive connectivity. The Internet allowed integration and coordination across firm value chains to a new extent, resulting in globalized value chains. By each previous IT-driven transformation companies have been forced to realize the implications and make strategic choices to cope with the new environment in order to stay competitive (Porter & Heppelmann, 2014). According to Porter & Heppelmann (2014), although both of the previous technology waves have had implications on value chains, none of them have affected products in the same way as the third IT-wave: the Internet-of-things.

1.1.1 Background on IoT

Today, firms stand at the brink of the third round of IT-driven transformation, namely Internet-of-Things ('IoT'). IoT is the collective term for products that have embedded sensors and actuators, which allow the products to connect to networks and thereby, send and receive data (Porter & Heppelmann, 2014). IoT encompasses everything from kitchen appliances, household appliances, headphones, lamps, and wearable devices; these technologies allow consumer goods to be controlled by for instance smartphones (Iansiti & Lakhani, 2014). Beyond consumer applications, these functions and sensor driven technologies are found within the realm of industrial goods in jet engines, windmills, construction equipment and more. Business-to-

business applications will account for nearly 70 percent of the value that is estimated will flow from IoT in the next ten years and is valued at up to five trillion US dollars (Bughin, Chui & Manyika 2015).

IoT creates a landscape of opportunities for large established firms, within their current and new markets and industries (Iansiti and Lakhani, 2014). Two of the important business opportunities that IoT allows for are increased operational efficiency and changing value offerings (Bughin et al., 2015). Through making use of sensors embedded in manufacturing equipment, firms are able to carry out more efficient processes and reach better-informed decisions in real-time. With regards to changing value offerings, Bughin et al. (2015) identify how IoT data and connectivity can be used to transform traditional products into services. The product sensors gather data which can be used to identify patterns that identify service-needs, software-updates, utility levels at different times which in turn can help identify needs before the customer even knows they exist (Iansiti and Lakhani, 2014). Furthermore, through the ability to track how and how often a device is being used, the provider can price and charge per use, creating revenue models based on subscription (Bughin et al., 2015). Sensor data is, for instance, used to predict when equipment is wearing down or needs repair in order to foresee maintenance visits earlier. The result of early service signaling is that unplanned downtime is reduced and maintenance cost can be cut by up to 40% (Bughin et al., 2015).

The new landscape for companies and industries where IoT is leading the way, creates both new and rephrased issues to solve. Iansiti and Lakhani (2014) argue that the role a business should have in an industry, how value is created and captured, and how relationships with current and future partners should be formed will ultimately change through the course of the industrial Internet age. Porter and Heppelmann (2014) further highlight how IoT has large implications for business strategy, and may even affect the fundamental question “Which business are we in?”

1.1.2 Background on Firm Boundaries

With the implications of IoT on value propositions and value chains, where to draw firm boundaries will ultimately change as it has before due to IT-driven transformation. Related to theories of the firm’s existence, *‘firm boundaries’* is one of the most fundamental concepts in business research and practice today (Grant, 2010). Firm boundaries is drawn around what the firm chooses to perform internally with regards to activities, parts and value offerings (Afuah, 2003). It is closely related to *make-or-buy decisions*, meaning the decisions by which the firm determines what to perform internally and what to source externally (Grant, 2010). Since the last IT-wave, firm boundaries have been most influenced by three theories from academia: transaction-cost-economics, the resource-based view and collaborative view(s). Transaction-cost-economics stem from the field of economics, and it emphasizes that the firm boundaries should be set based on costs, comparing costs of internalization with transaction costs of engaging in the market (Coase, 1937; Williamson, 1985; Fredikind, 2014). Although it has had its fair share of use, both research and academia realized that firm boundaries could need other considerations than just cost (Lonsdale & Cox). The resource-based view on firm strategy by

Penrose (1959) and Wernerfelt (1984) were thus applied to explain firm boundaries. The view emphasizes that a firm should begin by identifying its competitive advantage, found internally in resources and competencies to the firm, and draw its boundaries around anything related to the competitive advantage (Wernerfelt, 1984; Prahalad & Hamel, 1990). The emphasis for firms to find their competitive advantage and focus only on that had immense effects on firm boundaries when it grew in application in the late 1980's, resulting in firms performing less activities, parts and value offerings in-house and instead increase sourcing from the market (Lonsdale & Cox, 2000). The increase in sourcing gave rise to the third dominant theory on firm boundaries, namely the relational view by Dyer & Singh (1998). The relational view argues that firms can find competitive advantage within their boundary-spanning relationships with suppliers and partners, as within these relationships firms combine resources and competencies in unique ways difficult to replicate by competitors (Dyer & Singh, 1998). The relational view has been extended into the ecosystem view by Williamson & De Meyer (2012), who argue that firms need to consider their complete ecosystem as a source of competitive advantage. Combined, the relational view and ecosystem view can be referred to as 'the collaborative view(s)'. If sourcing relationships are managed correctly, the collaborative view(s) argues that the firm can remain focused on its competitive advantage (core) and hold a narrow scope, while also remaining flexible.

1.2 Empirical setting

Volvo Group Telematics, (hereafter referred to as 'VGT') provides manufacturers of cars and commercial vehicles with complete and competitive telematics offers to end-customers anywhere in the world. VGT is part of Volvo Information Technology, a wholly owned subsidiary of AB Volvo. VGT supplies the Volvo Group with telematics for their commercial vehicles, while also turning to external actors within the automotive industry under the brand 'Wireless Car'. VGT's technological solutions are at the center of IoT. VGT, as many companies competing within the realm of IoT, is currently faced with external threats of heavy competition, forcing the company to respond by evaluating internal processes and value offerings. VGT has for long obeyed under the rule of make-before-buy, but have realized such a tactic may not suffice in their current environment. In order to best compete in the changing business environment VGT is interested in understanding how to perform informed make-or-buy decisions by taking inspiration from how other large firms cross-industry view these decisions and what theory can add to the subject. The aim with this project for VGT is to develop improved foundations for make-or-buy decision-making and look into the opportunities of partner strategies.

1.3 Problematization

Within academic research today, firm boundaries is said to rely on grounded theories of the resource-based view, transaction-cost-economics and collaborative view(s) (Burt et al., 2003; Grant, 2010). The three theories have been developed and applied in times of stability, compared to the dynamic environment that firms face today, related to assumptions that the future is a linear extension of the past and present (Carlopio, 2010). IT-driven transformation has been

claimed to affect firm boundaries in the past and currently a third IT-driven transformation is growing in size and effect, namely IoT (Porter & Heppelmann, 2014). IoT is said to have implications on firms and their boundaries in a number of ways (ibid). The technological trend will force companies to ask what business they are in, look to expand their scope cross-industry and change their business model from product to service-based models, among other implications (Porter & Heppelmann, 2014; Iansiti & Lakhani, 2014). Therefore there is reason to beg the question whether existing theories can explain firm boundaries in the new IoT-driven transformation, or if new or modified explanations are needed because of IoT. Conclusively, the impact of IoT on firm boundaries remains to be explored in more detail.

1.4 Purpose and research question

Against the background above, it seems highly relevant to explore how firms view their boundaries and inherent decisions given the environment they face, and if continued emphasis can be given to the three grounded theories. Thus, this study has set out with the purpose to investigate how well three dominant theories on firm boundaries can explain how firms view their boundaries within the context of IoT. Hence, the study takes a starting point in the following research question:

- *How well can traditional theories on firm boundaries explain how firms view their boundaries within the context of IoT-driven transformation?*

1.5 Delimitations

The parameters set on this study are in regards to the given time frame of a master thesis project. Furthermore, the study is limited on the present; to give a snap shot of what is happening today and how firms view their firm boundaries in their current industry environment. The study is also limited geographically to Sweden, and specifically the view of the chosen case companies, which affects the generalizability of the results to other firms. Thus, the purpose of this research is only to try existing theories on the specific sample of firms and provide inspiration for future research with regards to firm boundaries within IoT.

1.6 Disposition

First, this thesis introduces the major areas of research: IoT as an IT-driven transformation and existing theories on firm boundaries. Thereafter, an outline of the research methodology is presented and described, to provide an overview of different tools and designs used to conduct the research. A conceptual framework on firm boundaries based on a literature review is then outlined and problematized. Following the theoretical outline, the empirical background and findings on the chosen case companies and their industries are introduced. Finally, the empirical findings are analyzed and set in comparison to the existing theories, to conclude and answer the research question. The thesis therefore ends with a presentation of the conclusions and recommendations for future research.

2. Research Methodology

The following chapter outlines the key methodological choices and considerations made by the researchers to conduct the study. Research design, data collection method, selection of case companies and structure of the research is outlined. The chapter concludes with quality considerations and critique of chosen method.

2.1 Research Paradigms & Strategy

The purpose of this study has been to explore how well existing theories can explain how firms view their boundaries within the third IT-driven transformation, dubbed IoT. Current research on the subject is limited; hence this study has taken a qualitative, inductive approach and tried to complement existing theory. According to Bryman and Bell (2015) an inductive approach is suitable for a complex and subjective topic in order to gain a more comprehensive understanding of a research problem. A qualitative study is also preferable when research does not aim to generalize results, but rather produce a snapshot that can prove interesting to expand upon in future research. Through deciding upon a qualitative research strategy, epistemological and ontological paradigms have implicitly been set as well. According to Bryman & Bell (2015) a qualitative research is normally in an epistemological position of interpretivism, meaning it stresses an understanding of the social world through an examination of the interpretation of the world by its participants. Therefore, the ontological position that is coherent with interpretivism is subjectivism (Bryman & Bell, 2015). With this perspective, reality is constituted by its participants rather than just “out there.” As a result, it should be highlighted that as qualitative research is based on the researchers’ interpretations it is subject to bias.

2.2 Research Design

With an explorative approach to the empirical data research, a cross-industry, multiple case study design has been applied. The multiple case study design can according to Yin (1984; Eisenhardt, 1989; Bryman & Bell, 2015) improve theory building in qualitative research as opposed to single case studies, therefore it has been deemed appropriate for this research project. The multiple case study design is helpful in allowing the research to identify patterns in similarities and differences in gathered data and can be better at supporting themes that arise from the research. Along with the aforementioned connection to multiple case studies, the design has been seen as appropriate for this study due to the pursuit of a cross-industry snapshot. The comparative design can, amongst other things, shed light on key distinctions between industries, as well as highlighting areas that are true for any group of industries. Based on time limitations only seven case companies have been involved in this research, however the companies have proven to give a fair amount of information that can be used to answer the research question. Data collection from annual reports, company websites and industry reports have also been used to complement the data gathered from interviews.

2.3 Research Method

2.3.1 Interviews as Primary data

The type of information that we aimed to gather were assumed to likely vary from organization to organization and different aspects could have been emphasized; types of discussions that may not be captured through survey questions or wholly structured interview method (Bryman & Bell, 2015). Therefore we have chosen to utilize interviews as data collection method, and more specifically, semi-structured interviews, meaning some major guidelines were set of what areas the interview should cover along with some questions for inspiration. The semi-structured interview allows information to come forth that can otherwise be missed when using surveys or other more restrictive information gathering methods (Bryman & Bell, 2015). Furthermore, semi-structured is relevant in researching an area, that is not clearly outlined in theory, to appreciate if the interview candidates were to add more perspectives and insights into factors that they find of importance in relation to the subject.

Bryman & Bell (2015) emphasize the importance of consistency in interview questions, even in semi-structured interviews, in order to ensure that relevant topics are covered in every interview and thereby a more consequent set of data is gathered that can be analyzed on a cross case basis. From the start, firm boundaries has been the main area of research in the pre-study leading up to the interviews. During the pre-study, when internal interviews were carried out with VGT and other internal meetings were held along with a review of literature, three key areas of research were found to be related to firm boundaries: strategic issues, trade-offs and view on sourcing relationships. As such, empirical data collection has been based on these three areas. A complete interview guide can be retrieved in appendix 1.

2.3.1.1 Selection of case companies and interviewees

Based on industry report overviews a variety of industries have been selected for this research, industries deemed to be affected by the IoT. The chosen industries are utilities, telecom, construction, manufacturing and commercial vehicle. One or two organizations within each industry have then been selected and targeted for data collection. The organizations have also been chosen based on their similar characteristics of size and maturity and to offer business-to-business solutions. According to Zahra Ireland and Hitt (2000), a large established firm is a firm that is six years or older, and has a turnover of €50 million or more and/or has more than 250 employees – the definition that has been used to define large established firms in this study.

Company	Size (employees)	Sales (bn)	Industry
E.ON	40,000	EUR 116,218	Utilities
Ericsson	116,281	SEK 246.9	Telecommunication
Göteborg Energi	1,050	SEK 5.641	Utilities
Skanska	43,000	SEK 155.9	Construction
SKF	48,593	SEK 75.997	Manufacturing
TeliaSonera	21,342	SEK 86.569	Telecommunication
Volvo Group	100,000	SEK 313	Commercial Vehicle/Automotive

Table 1. Summary of performed interviews

Bryman and Bell (2015) emphasize the importance of being consequent in the choice of interview candidates. It is of great importance to secure interview candidates that can speak with similar freedom, knowledge and insight into the research subject in order to carry out the most “true” analysis possible. Otherwise, there is a risk that results are skewed to the candidates that give the most information. In order to get a comprehensive understanding of the chosen case companies view on the topic, respondents have been chosen in regards to their connection to make/buy decisions on a continuous basis within the firm, and that preferably are further involved in external sourcing at the organization. In order to understand how they carry out sourcing relationships and carry out tactical decisions. During both the search for interview candidates and beginning of the conduct of interviews it became clear that at some of the chosen case companies our required insight could be spread among different roles at the firms. Hence, if an interviewee were to provide too little information the follow up step have been to contact another candidate within the same organization with more information regarding the subject in order to fill any knowledge gaps. Additional candidates have been sought at four out of the seven case companies. At Ericsson, two different divisions were sought out, thus resulting in the total of eight cases. Among the large firms investigated, a total number of three interviews with different people would have been desirable, however with the inherent time constraint of this research one or two have had to suffice. Below follows a list of the performed interviews:

Company	Position of interviewee	Type of interview	Date of interview
E.ON	Procurement Manager	Telephone	2016-04-22
Ericsson PC	Manager	Face-to-face	2016-04-18
Ericsson CVC	Head of Automotive Offerings	Telephone	2016-05-04
Göteborg Energi	Procurement Manager	Face-to-face	2016-04-07
Skanska	Head of Strategy Development	Face-to-face	2016-04-04
	Project Director	Telephone	2016-04-21
SKF	Business Controller Automotive	Face-to-face	2016-04-25
TeliaSonera Global IoT Solutions	Business Development Manager	Face-to-face	2016-04-05
	Senior Partner Manager	Face-to-face	2016-04-05
	External consultant (Antoma)	Face-to-face	2016-04-06
VGT	Solution Area Manager	Face-to-face	2016-03-31
	Supplier Manager	Face-to-face	2016-04-25

Table 2. Summary of performed interviews

2.3.1.2 Conduct of interviews

The initial goal has been to meet as many interviewees as possible in person, in order to receive their personal view of the questions and getting a more natural conversation flow with an open dialogue. Through face-to-face interviews, the opportunity to guide the respondents through the questions has been improved, which in many cases has proven to be essential. Nine out of the

total eleven interviews have been held face-to-face, while the remaining two have been held by phone. As has learned from the interviews held in person, it has been important to inform the phone-respondent about the purpose of our study to avoid unnecessary feedback but also to not waste the respondent's time. The face-to face interviews have been held in private so that the respondents could feel confident to answer the questions freely. All interviews have been recorded, and to further ensure the respondents would speak freely, all respondents were given the option to be anonymous. The major topics of the interview questions have been sent to the respondents one day ahead of the interviews to give them the opportunity to reflect and go over the topics beforehand. Such a strategy has been chosen since many of the respondents had a tight schedule, and through giving them a chance to look at the topics before the interview we hoped to receive richer answers. To provide the topics beforehand have been found to be successful, as the interviews remained focused on the primary subjects.

2.3.2 Industry reports

Industry reports provided by consultancy firms and other large corporations have been used to provide an empirical background on our chosen case companies' industries and their current relation to IoT. Industry reports have only been included if their source were by the researchers' view a "trustworthy" firm and if the reports were not older than five years. Trustworthy consultancy firms were firms such as McKinsey, PwC, EY, A.T Kearney, whom all are global firms with an established research department, which annually produce insights on different industries. Furthermore insights by the company Ericsson were added to provide an overview of IoT and its implications on business and society.

2.3.3 Literature review

A conceptual framework has been constructed with the help of an expansionistic literature review, which begun with the key words of 'make-or-buy decisions' and 'firm boundaries'. The conceptual framework has developed and grown through an iterative process of coding collected empirical data and expansion of literature review. The review has been narrative from the start, meaning it has been more wide-ranging in its scope compared to more systematic reviews (Bryman & Bell, 2015). A narrative literature review has been deemed suitable because of its greater flexibility for us researchers to modify the theoretical framework while analyzing data. The literature has been gathered through various valid sources, such as from our supervisor, academic databases (EBSCO, Business Source Premier, Google Scholar and JSTOR) and books from our university library.

Search words: make-or-buy decisions, firm boundaries, view on firm boundaries, sourcing, vertical boundaries, horizontal boundaries, strategy, sourcing relationships, collaboration in sourcing, IoT implications, IoT management, IoT firm boundaries.

2.4 Structure of Research and Data Analysis

The thesis has been conducted in close collaboration with Volvo Group Telematics. The project focus has been to provide insight on how to take make-or-buy decisions and corresponding

supplier and partner strategies the division might need. The request has risen from the fact that VGT has long been bounded by the Volvo Group's business rule of make-before-buy, but VGT questions if this rule suits their own division, as they are a telematics service provider rather than a product-firm. To gain an understanding for make-or-buy decisions and sourcing relationships the project has been focused on looking into other industries for inspiration along with a theoretical foundation. The theoretical foundation on make-or-buy decisions has been gathered through a literature review, which led us into the area of firm boundaries. Three dominant theories on firm boundaries have been found through the literature review, which have helped generate a conceptual framework. The conceptual framework generated from theory has acted as a guide for data collection and following analysis. For the purpose of the thesis, the subject has taken into consideration the current context of IT-driven transformation, named IoT, which is touching all industries and claimed to impact both industry and firm boundaries. Primary data has been gathered through semi-structured interviews with regard to how firms view their boundaries, and industry reports on each industry have been used to show each firm's current relation to IoT. Data analysis has been performed in accordance with grounded theory; meaning primary data has been coded into the three areas identified in the conceptual framework and with the help of the interview questions, which are designed to fall within the three areas of the conceptual framework. The areas that the coding has been divided into are strategic issues, trade-offs and sourcing relationships. The areas are designed to better understand the firms' views on their boundaries through the aforementioned factors that are considered in relation to the boundary decision. Continuous comparison of case companies occurred in the analysis, which generated similarities and differences between the companies as a way to find patterns within the firm decisions and the different case companies' divisions relation to IoT and their respective industries relation to IoT. The results have thereafter been set in relation to the three, dominant theories and theory on IoT, in order to answer how well the traditional, existing theories can explain how firm view their boundaries in the context of IoT.

2.5 Quality of the Study

Guba and Lincoln (1994; Bryman & Bell, 2015) argue that qualitative research should be evaluated based on its trustworthiness and authenticity. In order to produce high research quality within our thesis, focus has been put on achieving trustworthiness. To assure that the study is trustworthy a respondent validity check has been conducted, which enables the respondents to confirm that our impression of their answers reflects their actual view (Bryman & Bell 2015). The respondent validation has been carried out through sending to the respondents our summaries of their answers, to give them the chance to comment or change the presented empirical findings. The respondent validation also helps to meet obstacles such as language barriers as it guarantees that the respondents' answers have been understood correctly. Additionally, in order to reach confirmability of the research we as researchers have tried to distance ourselves from the subject of this thesis by keeping an objective mind throughout the process. Such has been the aim, however it cannot be assured and must be evaluated by the reader. We do however hope that a thorough methodological chapter can enhance such a fact.

2.6 Critique on Choice of Method

Beside from subjectivity, our methodological choice of a qualitative study is subject to other possible critique (Bryman & Bell, 2015). First, the study will prove difficult to replicate if applied to another setting by another researcher. Lack of replication rises because we as researcher are the main instrument of both data collection and analysis, hence what is captured through interviews and put forward in the results tend to be the product of our own predilections (Bryman & Bell, 2015). In defense, although we hope replication remains possible it has not been the aim of the study, rather the aim has been to inspire for future research within the area. Second, it should be highlighted once more that a qualitative approach leads to lack of generalization of the results to a larger population (Bryman & Bell, 2015). Generalization has not been a target of the study; the study has been specifically set on studying a group of companies and how they take make-or-buy decisions/view their boundaries. Time constraint has limited the sample to seven companies, well enough to provide inspiration for VGT but not large enough to generalize to other companies. Third, lack of transparency is inherent when choosing a qualitative research method (Bryman & Bell, 2015). The critique refers to that qualitative researchers tend to leave out specifics of how cases were selected and how analysis has been conducted. The risk is related to the non-linearity of qualitative research, that the steps involved are not completely clear (Bryman & Bell, 2015). To decrease the risk of such critique on our specific study, the previous sections about the research methodology has aimed at providing a thorough outline of steps taken.

4. Theoretical Framework

The following chapter presents the construction of a conceptual framework on firm boundaries that has been built iteratively with empirical data collection and step-by-step added relevant factors to the make-or-buy decision. Thereafter, IoT and its implications on firm boundaries are introduced and finally the three theories set in the context of IoT are problematized.

4.1 Firm boundaries

In order to set up a conceptual framework, the study has begun with what is at the center of the research and output of the model, namely: make-or-buy decisions, i.e. where to put firm boundaries. Make-or-buy decisions have been found to be related to *firm boundaries* from a theoretical perspective as the term firm boundaries are used in theory to understand what items and activities the focal firm carries out in-house and what it sources externally. It is firm boundaries, and consequentially the managerial decisions of make-or-buy, which will, amongst other aspects of organizations, be affected by IoT as outlined in the research introduction (Porter & Heppelmann, 2014). Firm boundaries refer to the vertical and horizontal scope of the focal firm (Afuah, 2003). Vertical scope refers to the activities and parts of the value chain that the firm chooses to carry out within the firm to produce its final value offering (Grant, 2010). The horizontal scope, on the other hand, alters the focal firm's boundaries by the degree to which the firm decides to diversify; meaning the scope of the value offering (Grant, 2010). According to Afuah (2003), altering a firm's horizontal boundaries refers to the firm's size (how much of the total product market will the firm serve) and scope (what variety of products and/or services does the firm produce).

The vertical boundary of the firm moves depending on the number of activities and parts in the firm value chain the firm choose to perform and produce (Grant, 2010). It can be broadened through *vertical integration*, when the focal firm works to internalize activities/items that a supplier or reseller could carry out or supply (Lonsdale & Cox, 2000). The opposite of vertically integrating with regards to activities or resources of the vertical value chain is referred to as *sourcing*, which means that the activity or resource is instead sourced externally through for example, arm's length transactions (Lonsdale & Cox, 2000). The more vertically integrated the firm is, the more broad its vertical boundaries are, while the less it "makes" in-house the more it moves along the sourcing axis and narrows its vertical boundaries.

The horizontal boundary moves depending on the market reach the firm has, and can be broadened through the business practice of *diversification*. Diversification means selling one or more additional product or service not related to primary value chain (Dosi, Gambardella, Grazzi & Orzenigo, 2008). Diversification is achieved either through acquisitions, meaning the firm buys another firm (Lonsdale & Cox, 2000), or through collaboration, when the focal firm cooperates with either a competitor or non-competitor (Saenz, Ubaghs & Cuevas, 2015), or through organic growth (Tjemkes et al., 2012). *Specialization* is the opposite of diversification, and refers to when the firm chooses to narrow its horizontal boundaries, and it's achieved

through for example divestment of products, services and/or business units (Lonsdale & Cox, 2000).

As outlined above, different business practices alter firm boundaries from broad to more narrow, and vice versa. When a firm has broad boundaries both on the vertical and horizontal axis, it is commonly referred to as a *conglomerate* (Lonsdale & Cox, 2000). Conglomerate firms were common in the post-war period in the 1950's and 60's when increased profits were thought to be found through market power and reach (Lonsdale & Cox, 2000). The opposite of these kinds of 'mega-firms' is commonly referred to as *virtual corporations*, which is when the firm keeps an extremely narrow vertical and horizontal scope through sourcing almost all aspects of the firm externally (Grant, 2010). Virtual corporations has grown in spread since the 1980's, when conglomerates were found to be underperforming the market, which gave rise to re-focusing era where firms reversed to only focus on their core business in order to survive (Lonsdale & Cox, 2000).

4.2 Three theories on firm boundaries

Second to the output of the model, three established theories, which have been applied to explain firm boundaries in previous research, have been reviewed and outlined in the following section. These are: transaction-cost-economics (Coase, 1937; Williamson, 1985; Grant, 2010; Fredikind, 2014), the resource-based view (Wernerfelt 1984; Prahalad & Hamel, 1990; Conner & Prahalad, 1996) and the collaborative view(s) (Dyer & Singh, 1998; Chesbrough, 2003; Williamson & De Meyer, 2012).

Transaction-cost-economics

In 1937 Ronald Coase, founder of the transaction cost economics ('TCE'), made one of the first attempts to define the firm in relation to the market (Fredikind, 2014). To explain the firm's existence, Coase (1937; Connor & Prahalad, 1996) began by distinguishing between the firm and the market in terms of characteristics. Set in the context of market economy (the basis for many economics theories according to Grant, 2010), a firm is different from the market in the sense that the former incorporates authority, meaning it allows parties within the firm to exercise control-rights/direct/manage the actions of other parties (Coase, 1937; Connor & Prahalad, 1996). In the market, all parties are seen as acting autonomously. Based on such a distinction, firms exist to avoid large transaction costs that a market in itself entails. Transaction costs arises from contracting, bargaining and searching for information, to discover relevant prices. In comparison, within a firm exist only administrative costs of organizing, which are based on fewer contracts (Grant, 2010).

The ultimate reason for the firm's being is hence to carry out parts and activities at lower costs compared to the market. Such a theory has been claimed by business research to have managerial implications, which resulted in that author Williamson (1985; Fredikind, 2014) tried to establish TCE's application in business practice. Williamson (1975; Fredikind, 2014) found that two relevant key assumptions act as the backbone—to TCE, namely *bounded rationality* and

opportunism. Bounded rationality refers to that individuals, or ‘human agents’ as Williamson calls them (1985, p.30), are unable to act on a rational basis due to their limited view on their surroundings, which is one of the reasons carrying out transactions on the market can prove so costly. In the context of TCE and economic organizations, contracts are subject to bounded rationality and hence will never be fully complete in covering all potential risks. The second factor, of opportunism, assumes that individuals are self-interest seeking (Williamson, 1985, p. 30). Opportunism within the context of contracts results in human agents following their own intentions rather than acting in good faith towards another party as has been agreed upon. Under the assumptions of bounded rationality and opportunism, the transaction-cost-economics theorem can be used to explain where firms put their boundaries (Williamson, 1985; Fredikind, 2014). Make-or-buy decisions can then be made by comparing the relative cost of internalizing the activity or item, compared to transaction costs of sourcing externally (Williamson, 1985; Fredikind, 2014). Transaction costs for contracting, bargaining and searching for information are affected by three factors: asset specificity, uncertainty and frequency of transactions. Asset specificity refers to the degree of firm-specific resources used to produce the component in terms of human, physical and site (Williamson, 1981; Fredikind, 2014). Uncertainty represents negative externalities that require the organization to adapt, and frequency means how often a transaction is going to occur.

Grant (2010) further outlines the view of TCE, and claims that there are drawbacks and benefits inherent in both vertical integration and sourcing from this perspective. Evaluating boundaries based on cost economics entails comparing transaction costs that arise when the firm engages in the market through sourcing, with the administrative costs of integration. The most beneficial governance mode would depend on different factors, one of them being level of external uncertainty, as outlined above (Williamson, 1985; Fredikind, 2014). External uncertainty requires different types of flexibility by the firm. When a firm faces uncertain demand conditions, sourcing rather than vertical integration entails lower costs and enhances flexibility of the firm to respond faster to changing circumstances (Grant, 2010). An example of such a case is the construction industry where vertical integration has decreased in favor of market transactions in order to better adjust to cyclical patterns in demand and different requirements per construction project. In product-based industries, where niche technological capabilities and fast-cycle product development are required, such as in mobile phone industries, companies have turned to sourcing over vertical integration as well. However, when system-wide flexibility is needed throughout the value-chain, companies have turned to vertically integrated models, such as in the fashion retail industry, in order to assure speed across the whole value chain. Hence, from a transaction-cost-economics view, sourcing externally may yield increased flexibility when firms are faced with uncertain and cyclical patterns of demand (Grant, 2010). The transaction-cost-economics view further argue that firms make the trade-off of becoming dependent on suppliers or not when choosing their vertical scope (Bahli & Rivard, 2003). Burt et al. (2003) extend the discussion on supplier dependency risk and state that it is something that occurs when firms source externally and mainly with few suppliers, thus risking becoming

locked-in to the specific suppliers. Dependency is related to *control*, the more a company sources, the less control it may have over all parts of its business (Burt et al., 2003).

TCE has been criticized in literature (e.g. Dobrzykowski, Tran & Tarafdar, 2010; Tjader et al., 2014) for being too narrow in its view on firm boundaries, as it only focuses on costs. Opponents claim that firms may want to source/internalize based on other motives than just cost, e.g. based on strategic reasons, which is why other theories such as the resource-based view ('RBV'), and its extension, the competence-based view, are claimed more suitable to determine firm boundaries (Dobrzykowski, Tran & Tarafdar, 2010).

The-resource-based view

The emphasis on resources was first outlined by Penrose (1959; Barthelemy & V. Quelin, 2002) who argued that the firm is more than an administrative unit: it is a heterogeneous bundle of resources that accumulates knowledge. In comparison to the TCE, the RBV grew from strategic management research instead of from the field of economics, and has been further developed by Wernerfelt in 1984. In his research, Wernerfelt (1984) claims that resources, internally to the firm, should be the unit of analysis to find a competitive position. Examples of what resources can be are brand name, technology, personnel, machinery, and capital, among others; tangible and intangible assets tied to the focal firm (Wernerfelt, 1984). Previous strategic management had emphasized products and markets as the primary source of competitive advantages (e.g. Porter, 1980; Grant, 2010). Wernerfelt (1984) simply flipped the coin, as most products require several resources to be produced and most resources can be used in several products. As such, by specifying the resource-profile of a firm, it would be possible to find the optimal product-market combination for the firm (Wernerfelt, 1984). From the outline by Wernerfelt, Connor and Prahalad (1996) extended the assumptions of firm heterogeneity into a resource-based theory of the firm. The authors claim that the heterogeneous bundle of resources create superior performance of firms relative to competitors and markets, which is why it exists.

The RBV thus suggests that firms should find how they are different from other firms (heterogeneity) in terms of resources and capitalize on these differences in order to survive (Grant, 2010). To contribute to competitive advantage, resources should be rare, valuable, imperfectly imitable and non-substitutable (Barney, 1991; Bohnenkamp, 2013). When resources fulfill the aforementioned characteristics, they create entry barriers for competitors and eventually lead to sustainable (long-run, enduring) competitive advantage (Barney, 1991; Bohnenkamp, 2013). Apart from the assumption that firms are *heterogeneous*, the RBV also rests upon *bounded rationality* (Conner & Prahalad, 1996). Bounded rationality in this case differ from TCE, in the sense that it does not increase opportunistic behavior, but rather result in tacit knowledge held by individuals and firms (Conner & Prahalad, 1996). In this sense, tacit knowledge means knowledge that can be learned only through personal experience and is difficult to transfer. The emphasis on tacit knowledge is at the essence of the RBV; it is the primary resource that contributes to competitive advantage (Conner & Prahalad, 1996).

Furthermore, the view proposes that whatever is defining and unique to the firm in terms of resources should remain under its control (Dobrzykowski, Tran & Tarafdar, 2010). If the firm requires extending its resource base, acquisition is the primary choice, to internalize (Wernerfelt, 1984). With such emphasis, the RBV have been deemed suitable to determine firm boundaries (see for example: Bogucki Duncan, 1988; Lonsdale & Cox, 2000; Espino-Rodriguez & Padrón-Robaina, 2006).

The resource-based view has been extended into the competence-based view of firms (Prahalad & Hamel, 1990; Dobrzykowski, Tran & Tarafdar, 2010). The competence-based view claims that the competencies held by the firm (shaped by the firm's resources) are the main sources of competitive advantage for the firm (Prahalad & Hamel, 2003). The authors suggest that firms identify which of their competencies or offerings can be deemed 'core', and as such be referred to as a strategic advantage. In this sense, competencies are defined as "the company's collective knowledge about how to coordinate diverse production skills and technologies" (Prahalad and Hamel, 2003, p. 1). Prahalad & Hamal (2003) suggest that a firm's core competencies can be identified through asking four questions, "1) How long could we dominate our business if we didn't control this competency? 2) What future opportunities would we lose without it? 3) Does it provide access to multiple markets? 4) Do customer benefits revolve around it?" According to Prahalad & Hamel (1990) what should be performed in-house are the activities or items of the firm that are closely related to core competencies, and what is non-core should be sourced externally. According to Lonsdale & Cox (2000), when the competence-based view gained foothold it led the "focus" era of firms, turning previous conglomerates into firms with narrower boundaries through divestment and outsourcing.

Further research on the competence-based view has shown that sourcing all that is non-core does not come without trade-offs (Lei & Hitt, 1995; Espino-Rodriguez & Padrón-Robaina, 2006). The main point of both RBV and the competence-based view is for firms to become more focused through shrinking its horizontal and vertical boundaries, but when doing so the firm risks competence erosion (Espino-Rodriguez & Padrón-Robaina, 2006). Competence erosion refer to that external sourcing may lead to loss of both new and old competencies, which in turn affects the firm's ability to recognize and respond to new market opportunities (Espino-Rodriguez and Padrón-Robaina, 2006). Wernerfelt and Karnani (1987) investigated the effect of when a firm becomes more focused with regard to its horizontal scope and claimed that it can enable a faster learning curve. However the opposite, diversification, may prove more beneficial when faced with uncertainty, as the firm then places bets in several baskets and lowers its risk (Wernerfelt & Karnani, 1987).

Although the RBV and its extension into the competence-based view gained strong foothold in the 1990's both in academia and business practice, it received critique for only focusing internally to the firm with regard to competitive advantage (Dyer & Singh, 1998). Dyer & Singh (1998) strongly emphasized that competitive advantage could be found in inter-organizational

relationships, an emphasis which came to be known as the relational view, later extended into both the open innovation view and the ecosystem view.

Collaborative view(s)

Dyer & Singh (1998) developed the relational view in another attempt to define how firms can achieve competitive advantage and as such above-normal returns. The authors claimed that other theories, such as the resource-based view and the market-view by Porter, fail to acknowledge that the possible advantages of a firm are often linked to the advantages of the network of relationships in which the firm is embedded (1998). The relational view argues that critical resources to the firm may extend beyond firm boundaries, and that firms, which combine resources in unique ways with each other, may have an advantage over firms not doing so. Hence, the relational view rests upon the assumption of resource heterogeneity, but instead of from within the firm, the heterogeneity arises from the conjunction of two firms' distinctive resources through an alliance. Relation-specific combination of resources has shown to produce increased rare, imperfectly imitable, non-substitutable and valuable resources compared to each firm's distinctive resources before combination (Dyer & Singh, 1998). Such relation-specific resources create dyadic/network barriers to imitation against competing firms, and eventually competitive advantage (Dyer & Singh, 1998). The competitive advantage is sustained when the firm has access and continually utilizes the key resources that they have created across firm boundaries (McIvor, 2005).

The relational view is not ignorant of opportunism as another assumption (Türkmen, 2013). The threat of opportunism can however be reduced through creating collaborative relationships, such as partnership alliances, instead of engaging in just arm's length transactions when sourcing (Dyer & Singh, 1998). Arm's length relationships cannot create more value than any other seller-buyer combination as there is nothing unique about the relationship and it is easily imitable (Dyer & Singh, 1998). While the alternative proposed by Dyer and Singh (1998), partnership alliances, are characterized by one or all of the following: 1) investments in relation-specific assets 2) substantial knowledge exchange, including exchange of knowledge that results in joint learning, 3) the combining of complementary, but scarce, resources or capabilities, which results in the joint creation of unique new products, services, or technologies, and 4) lower transaction costs than competitors alliances, owing to more effective governance mechanisms. Furthermore, long-term contracts with suppliers offer a protection against opportunism of the two parties involved. Vendor partnerships are a common definition of close collaboration between the focal firm and its suppliers, where there might only be relational contracts and no written contracts at all. Such agreements are based on trust and mutual understanding and provide flexibility to meet uncertain circumstances, if any. (Grant, 2010)

The outside-in perspective on firm performance such as the relational view has resulted in other researchers' attempts to extend such emphasis. Open innovation theory is another and is defined as "an approach that makes the most of organization networks, such as customers, suppliers,

teaching institutions, and research institutes in order to increase the innovation capability of an organization” (Chesbrough, 2003) Open innovation, similar to the relational view, focuses on the benefits of inter-firm collaboration in order to achieve objectives that a firm had not been able to meet otherwise. Chesbrough (2003), describes open innovation as a two-way road for innovation, ideas are taken in from external parties such as end-users, business collaborations and partner universities, while at the same time there occurs a process of pushing un-utilized ideas out of the firm. Open innovation and in particular “outside in” innovation, which implies bringing products, services and innovations developed outside of the organizational boundaries into the organization is the type of thinking that is on the other side of the paradigm from the traditional “do it yourself” mentality (Chesbrough, 2003). The open innovation view is defined as the systematic adoption of partnerships in the innovation process rather than resorting to internal R&D structures as in the classic model of innovation.

Although there are many synergies between the relational view and open innovation, there are differences in practice (Chesbrough, 2015): The relational view focuses on the management of each individual alliance partnership of two actors in creating joint value. Whereas, open innovation views the value gained from the *entire network* to joining sources within innovation to create value (Chesbrough, 2015). In the sense of open innovation as a network view, where value is created as a whole, it can be seen as an extension of the dyadic relational view.

Apart from open innovation as an extension of the relational view, an additional view on collaboration has been brought in to broaden the view on boundary-spanning activities as a source of competitive advantage. That is the ecosystem view, as proposed by Williamson and De Meyer (2012). The ecosystem view proposes that the value a company creates and the future of the company is directly related to the “health” of its ecosystem. Williamson and De Meyer (2012) argue that ecosystem strategies can provide a secure basis for competitive advantage in market environments where customers demand complex, integrated solution and when knowledge is dispersed across different organizations around the globe. Ecosystem strategies mean that a firm creates loosely coupled networks or ecosystems, managed by the focal firm, tying together actors through a structure of interactions and cooperation agreements.

In their outline, Williamson and De Meyer (2012) argue against a sole ‘core-focus’ by firms as proposed by the competence-based view. When a firm only focuses on a few core activities or competencies it may enable easier capital expenditure targeting on deploying e.g. the latest technology on their core activities and as such deepening their core competencies, but there are also drawbacks with such a strategy. A ‘focus-and-win’ strategy can be argued as insufficient when customers demand more complete solutions that bring together multiple products and services in often-customized bundles, as this will require the firm to extend their offering to succeed. Williamson and De Meyer (2012) therefore argue in favor of an ecosystem strategy, where the firm besides from its core strategy puts time and effort into managing its ecosystem. Hence the authors suggest for a core-strategy to be complemented by an ecosystem strategy when facing rapid external changes. Instead of engaging in M&A’s to reach new capabilities (as

proposed by the RBV), a firm with a core-focus can remain flexible when using the ecosystem/network to reach new capabilities through partnerships. Furthermore the authors argue against the other end of the continuum: highly vertically integrated firms, who perform all of their activities internally. Vertically integrated firms may lead to economies of scale, but at the expense of high capital investments, and furthermore rigid structures that are difficult to reconfigure at the same pace as a fast-developing external environment. Williamson and De Meyer (2012) therefore highlight how ecosystem strategies in comparison to vertical integration can enable economies of scale with less capital investments. Ecosystem strategies enable dynamic re-configuration among parties involved and for the firm, and accelerated learning by bringing together a diversity of actors with different competencies and experiences (Williamson & De Meyer, 2012).

4.3 Summary on the three theories

The previous section has provided a literature review of three dominant views on firm boundaries: transaction-cost-economics stemming from the research field of economics, the resource-based view (extended into the competence-based view) and the more nascent collaborative view(s), both from the area of strategic management.

When viewed in isolation, each theory can be seen as guiding make-or-buy decisions of firms. The transaction-cost-economics claims that cost is the final, determining factor, and that firm boundaries will only span as far as to where the firm's relative performance to the market diminishes. Make-or-buy decisions will include comparing transaction costs in the market with the administrative costs of internalizing. Meanwhile, the resource-based view claims that competitive advantage found within the firm is the determining factor, and that firm boundaries will only be drawn around what contributes to competitive advantage. Make-or-buy decisions entail specifying if activities or parts are related to the firm's predefined competitive advantage, if not they will be deemed non-core and sourced through the market. The collaborative view(s) are complementary to the RBV and claim that competitive advantage can be found in the firm's ecosystem, and boundary-spanning activities are emphasized. Make-or-buy decisions can thus be claimed to include a large emphasis on external factors, and if the firm manages its ecosystem actively sourcing through the market will be preferred in many cases.

When the RBV and collaborative view are applied to firm boundaries and inherent decisions it entails for firms to take base in their strategy and define their competitive advantage. The two views do however differ with regard to where to find competitive advantage; RBV emphasizes that the firm's internal resources (competencies by the competence-based view) are the primary source of competitive advantage, while the collaborative view argue that external relations are the source of competitive advantage. Meanwhile the TCE view is based on neoclassical economic theory and when applied to firm boundaries and make-or-buy decisions it has been criticized for not taking base in firm strategy and just emphasizing cost minimization. It can be concluded that each theory implies different determining factors as to what makes up the basis

for make-or-buy decisions in relation to firm boundaries. Hence, this is the first part of our conceptual framework on make-or-buy decisions: determining issues on where to put firm boundaries.

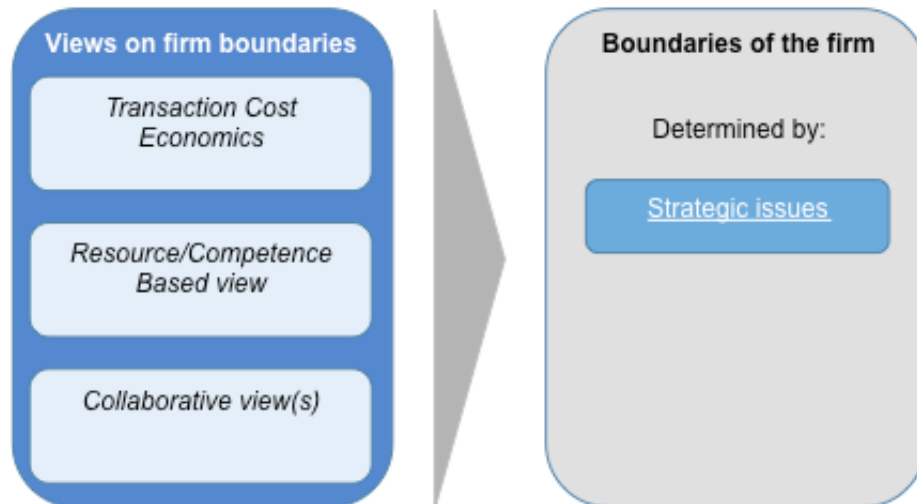


Figure 1. Strategic/determining issues that influence firm boundaries and hence are included in make-or-buy decisions

Besides determining factors, the views imply trade-offs when altering firm boundaries. With the assumption that agents within organizations are self-interest seeking and bounded in their rationality, TCE emphasizes dependency and loss of control as two risks that arise when a firm engages in sourcing instead of integration. With the notion that firms seek cost minimization, the TCE will argue for sourcing as a way to enhance firm flexibility (through lower fixed costs) when faced with uncertainty. In comparison, proponents of the RBV have argued that, although the firm should only focus on its core competencies, sourcing may entail competence erosion of both existing and new competencies that could become core. Meanwhile according to RBV, through focusing the firm can enhance the learning curve of those competencies kept in-house, while diversification can enable better flexibility when faced with uncertainty. The collaborative view(s) also argue about trade-offs, with an emphasis that through being a complement to when a firm only focuses on its core, proactivity in ecosystems can enable faster reach for new competencies without necessarily any internalization, but through partnerships instead. The emphasis by all view on trade-offs results in the second part of our conceptual framework on make-or-buy decisions: trade-offs considered when altering firm boundaries.

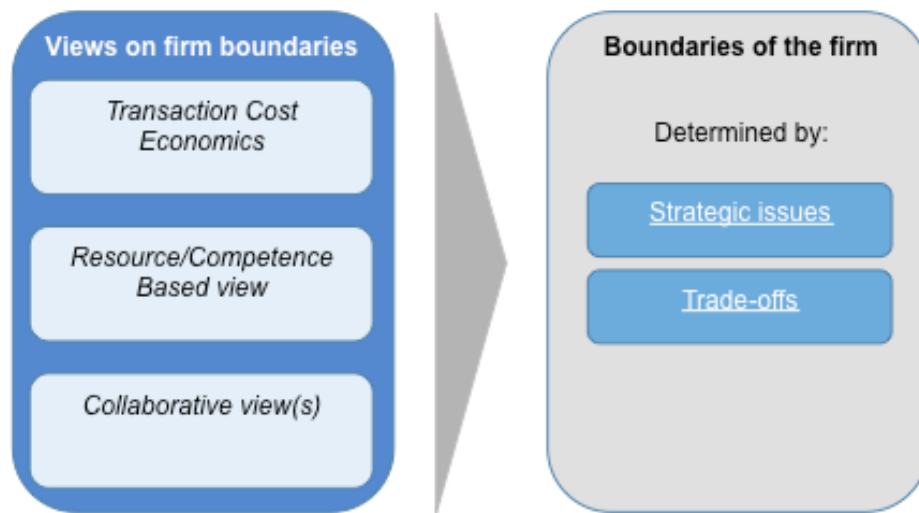


Figure 2. Different trade-offs are considered when altering firm boundaries

The effect of TCE and RBV in the 1980's and the following decade was that the scope of firms shrank through an increased emphasis on sourcing. The TCE emphasizes that sourcing can only occur if the firm can establish non-costly contracts, which is why the view argues in favor of arms' length transactions over hybrid relationships such as alliances. Meanwhile the collaborative view(s) view sourcing relationships and ecosystems as sources of competitive advantage. From the collaborative view(s), managing external relations, i.e. make relation-specific and ecosystem investments, can decrease threat of opportunism and thus improve chances of reaching sourcing objectives. In comparison, the RBV argues in favor of acquisitions when new competencies or resources are needed, adding that alliances are an option when too many of the prospective acquisition resources are redundant. Hence, we conclude that there is a difference between the three views with regard to their views on sourcing relationships and the degree to which it is included in decisions on firm boundaries. The view on sourcing relationships will therefore be included into the conceptual framework as a third part as it is also a factor that should be considered when taking make-or-buy decisions that determine the boundaries of the firm.

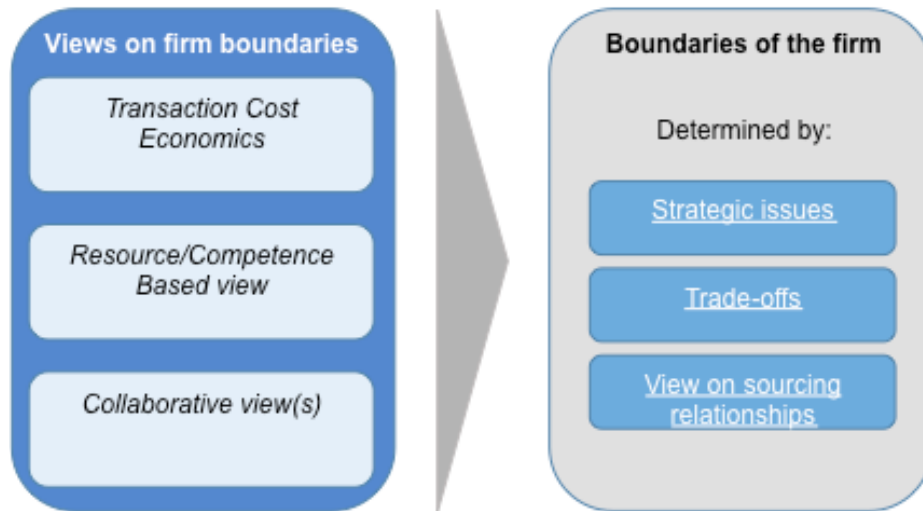


Figure 3. Final conceptual framework on make-or-buy decisions, based on three theories on boundaries of the firm

Figure 3 shows our final, conceptual framework derived from the three dominant theories on firm boundaries. In short, it claims that make-or-buy decisions are related to firm boundaries, which will be based on strategic issues, trade-offs, and view on sourcing relationships. The following table outlines the major implication of each theory on each aspect of the framework:

Area of make-or-buy decision	TCE	RBV	Collaborative
Strategic Issues – guiding view to determine boundaries	Cost minimization	Competitive advantage should be held in-house by the firm	Competitive advantage can be found within sourcing relationships
Trade-offs with sourcing and resulting boundaries	Dependency, control, flexibility (from lower fixed costs)	Competence erosion	Flexibility enhanced through proactivity in ecosystem
Sourcing relationships, role in boundary decisions	Arms' length transactions when sourcing, maintain in-house if cost advantageous to the market	Arm's length when sourcing non-core and acquisitions are preferred if sourcing items are core	Hybrid relationships and ecosystems, meaning that companies should look to market for options before decide make-or-buy

Table 3. A summary of each theory's implication on the conceptual framework

4.4 Theory on IoT

According to Porter and Heppelmann (2014), IT-driven transformation has an impact on firm boundaries. In the past, IT-driven technologies have largely impacted business practice two times. The first was in the 1960's and 70's, when individual activities in firms' value chains were automated, which enabled large amounts of data to be captured and analyzed within each activity. The first wave resulted in the standardization of production processes, and companies were faced with the dilemma on how to reap the benefits of IT-driven operational efficiency, while maintaining competitive advantage. In the 1980's and 90's, the rise of the Internet appeared and is referred to as the second IT-driven transformation wave. The Internet enabled coordination and integration across individual activities of the value chain: with suppliers, customers, and channels and across geography. The second wave enabled firms to integrate globally distributed value chains. What is similar for the two before-mentioned IT-driven transformations is that both affected firm value chains (vertical boundaries) but left value offerings unaffected. Today, a third wave of IT-driven transformation is occurring, and it is referred to as Internet-of-Things ('IoT'). (Porter & Heppelmann, 2014)

IoT is the collective term for products that have embedded sensors and actuators, which allow the products to connect to networks and thereby, send and receive data (Porter & Heppelmann, 2014). IoT encompasses everything from kitchen appliances, household appliances, headphones, lamps, and wearable devices; these technologies allow consumer goods to be controlled by for instance smartphones (Iansiti & Lakhani, 2014). The product sensors gather data which can be used to identify patterns that identify service-needs, software-updates, utility levels at different times which in turn can help identify needs before the customer even knows they exist (Iansiti and Lakhani, 2014). Furthermore, IoT is highly applicable within industrial settings, where sensors have been embedded in manufacturing equipment, which allow firms to autonomously coordinate and optimize processes (Porter & Heppelmann, 2014).

Iansiti and Lakhani (2014) argue that the role a business should have in an industry, how value is created and captured, and how relationships with current and future partners should be formed will ultimately change through due to the age of IoT. Porter and Heppelmann (2014) further highlight how IoT has large implications for business strategy, and may even affect strategically fundamental questions such as "*Why does our firm exist?*" and "*Which business are we in?*". According to Porter and Heppelmann (2014, 2015), IoT will in comparison to previous IT-driven transformations have even larger effects on firms, as it affects both value offerings and value chains (vertical and horizontal boundaries). Embedded sensors, software and connectivity in products, coupled with a cloud in which product data is stored and analyzed, are driving huge performance and functionality improvements for the products. Furthermore, reshaping products into IoT solutions affects the firm value chain, as the products now require new product-designs, marketing, delivery and after-sales services. Offerings within IoT also require companies to build completely new technology infrastructure, often referred to as a "technology stack". The technology stack usually includes modified hardware, software applications, operating systems

embedded into the product, network connectivity, product cloud and an application platform. Huge amounts of data generated from the products will require firms to put up new functions as product data analytics and data security. (Porter & Heppelmann, 2014)

In order to stay competitive within the IoT wave, Porter and Heppelmann (2014) argue that companies have a number of key questions to ask themselves when faced with IoT. One thing to consider is that a company must choose how it will deliver unique value to the customer by capitalizing upon the opportunities of IoT: “what set of smart, connected products features and capabilities should the company pursue?.” There is a wide range of features and capabilities to choose from and the authors suggest that companies should choose based on their specific customer needs. Second, companies must evaluate whether to change their current business models. The large amounts of product data and the ability to anticipate, reduce, and repair failures can improve product performance and optimize services. Optimized services changes traditional product value propositions into product-as-a-service propositions, in which the company retains ownership and keeps full responsibility for the cost of operation and service in return for an on-going charge. An on-going charge is often referred to as a subscription model, where customers pay as they go and not upfront. Besides altering revenue-models, when product turns into services (servitization) it entails a different mind-set by the firm (Baines, Lightfoot, Benedettini & Kay, 2009). Services are *performed* rather than produced and then sold (Vandermerwe & Rada, 1988; Baines et al., 2009) and services are ‘fuzzy’ and hard to define in comparison to products (Slack, 2005; Baines et al., 2009). To cope with this, customer-centricity become increasingly important, in order to tailor solutions to perform in accordance with each customer’s preferences (Baines et al., 2009). Furthermore customer interaction must change from transaction-based toward relationship-based, meaning the focus will no longer be on selling products but rather on maintaining a relationship with the customer (Oliva & Kallenberg, 2003; Baines et al., 2009).

According to Porter and Heppelmann (2014) the scope of the firm is another consideration companies will have to make. Not only does IoT alter existing value offerings, it also often broadens industry boundaries, enabling bundling and product systems instead of stand-alone products. Changing industry boundaries means that companies, which have been industry leaders within their fields for decades, may find themselves playing rather a supporting role in the new landscape. Companies therefore have two choices with regard to their scope: it can expand into related products within the emerging product systems, or it can seek to create the platform that connects the different, related products, even if it doesn’t make or control all the products. All and all, shifting industry boundaries may force companies to rethink their corporate focus, core mission and value proposition. Finally, the company must decide whether it should develop the full set of smart, connected product capabilities (technology stack) in-house or outsource to external parties. There are trade-offs involved in both governance modes; internalizing required capabilities leads to greater control over functionality, features and product data, and can lead to

a steeper learning curve for the firm, first-mover advantages and the opportunity to influence technology development. Meanwhile sourcing through the market can save time and costs and enable reach of purely specialized suppliers and partners at each layer of the technology stack. However outsourcing can also cause loss in value capture, as outside suppliers and partners require a greater share of the value created. Traditionally, early movers within IoT were forced to build all capabilities of the stack in-house, as external supply was scarce. With the increased spread and adoption of IoT however, a large number of robust and capable suppliers emerge that secure high-performance application platforms and ready-to-use data analytics, turning previous in-house capabilities of the focal firm redundant and under-performing in comparison.

4.5 Problematization of three theories

In section 4.1 to 4.3 theories on firm boundaries have been outlined and summarized into a conceptual framework for make-or-buy decisions. The framework is based on established business practice and academia, using the resource-based view and transaction-cost-economics, and the later collaborative view(s). Each of the views on the boundaries of the firm are grounded theories and are established pre or post an industry or business practice “change”, which means they are designed for firms carrying out business as usual in times of stability. However currently and for the purpose of this thesis, firms are set within the context of IoT, an external phenomenon that is affecting organizations in a number of ways. Even though IT-driven transformation has occurred before and the three theories has thereafter been applied and proved successful, the new transformation is said to have increased impact on business and society than any transformation before. Hence, it begs the question whether these views, can fully explain the way that organizations, within the context of IoT, view their boundaries, or if new or modified explanation of firm boundaries is needed.

With regards to the RBV, the assumption that competitive advantage can be sustainable becomes questionable when firms face dynamic environments. There is an ongoing debate on whether core competencies are in fact ‘core rigidities’; that the more highly developed a company’s competencies are, the narrower its repertoire and the more difficult it is for the firm to adopt to new circumstances in its environment (Leonard-Barton, 1992; Grant, 2010). Here the collaborative view(s) claims to provide the answer: it proposes that the firm should complement its core with flexibility gained through proactivity in its ecosystem. As such the firm will remain focused on its core but not limited when new opportunities arise. In this sense, we argue that the collaborative view(s) argues that the core still remains stable and rigid to the firm. The notion that core can guide the make-or-buy decision by firms can be further questioned as IoT affects value offering and may even entail that firms reconsider their core focus and mission, as outlined above.

The TCE have been criticized before for being too narrow and only emphasizing costs as a determining issue with regards to firm boundaries. Furthermore TCE views the threat of opportunism as something that only will increase transaction costs, and if so the firm should

choose to internalize rather than source through the market. One of the implications by IoT is for firms to reach cross-industry capabilities, and for this the threat of opportunism cannot remain a barrier, as collaboration will be necessary. Finally, when products turn into services it entails for new basis in decision-making, as although products may have been more easily evaluated based on cost, services that have an on-going life cycle and will thus be more difficult to evaluate. The following pages of this study will outline an overview of seven case companies and their view on their boundaries, finally analyzed to see to what extent these theories can explain business practice today.

5. Empirical Introduction

The following empirical introduction is provided to give an overview of the case companies, the interview candidates and their respective divisions within the case companies that have been interviewed.

E.ON Sverige

E.ON is one of the largest electric utility companies in the world with business areas within energy networks, customer solutions, renewables, and energy efficiency & distributed energy, sales, technical services and nuclear energy (E.ON, 2016). In the company's 2015 annual report, released March 9, 2016, the company states that focus going forward is within the areas of renewables, energy networks and customer solutions with the aim of putting these areas at the focus of what E.ON does and also in order to have a more "resolute" focus on the customer. On E.ON's company webpage, Johannes Teyssen, the current CEO, describes the energy markets where E.ON competes as "changing rapidly, and [where] competition is key". Teyssen points out that the "customers' energy needs are changing dramatically [and] a new energy world is emerging, one that is decentralized, green, and interconnected. In 2014, E.ON began an internal transformation towards a new strategy called, "Empowering customers. Shaping markets", as a reaction to the company's changing business landscape (E.ON, 2016)."

Department/Business Unit	Assigned number & position
E.ON Sverige AB	(1) Procurement Manager

Ericsson

Founded in Sweden year, 1876, Ericsson is today a multinational corporation, which is active within over 180 countries. The company's traditional business is within communication technology with business areas within radio, "packet core" and transmission and telecommunication services. Business areas are broken into networks, which cover products and solutions for communication through mobile and fixed broadband networks including 2G-, 3G-, 4G networks, IP (Internet Protocol) and transmission networks along with "Evolved Packet Core" and cloud services. The business area called "Global services" develops networks and corresponding support systems, "Professional Services" and network installation are included in this segment. The business area, "Support solutions" focuses on software for business support systems (OSS and BSS) along with cable TV, media and mobile. Ericsson has positioned itself at the forefront of communication technology (Ericsson Annual Report, 2015) and describes the past 15 years within the industry as transformative in regards to an evolution that has occurred. The company describes the transition as follows, "[We have gone from] being a hardware-centric [industry] to becoming increasingly software- services-centric...today close to 70% of sales derive from software and services." With regards to the product areas: radio, packet core and transmission, the company's strategy is to use economies of scale and efficiency to enable success within the portfolio and in turn contribute to the best user experience, maximize the customer's innovation and efficiency and finally to maximize shareholder value (Ericsson,

2016). The business area “packet core” specifically refers to the product area within IP and transport at Ericsson that aims to offer the “capacity, functionality and superior performance needed for next-generation broadband.” The business area focuses on being cost effective and reliable with scalability as an additional characteristic of the offering, which delivers mobile data services and connects to both broadband and IP networks (Ericsson, 2016). Connected Vehicle Cloud, is a division within one of Ericsson’s identified “growth areas” within the business area called Industry & Society. The solution is specifically within the area of transport and Ericsson describes it on the company webpage as a “platform that enables application developers, government organizations, businesses, and automotive manufacturers to reach drivers and passengers with services and information.” The offering is based on an existing Ericsson offering, their Service Enablement Platform, and is aimed at “target[ing] the global automotive industry’s existing and future demands for scalability, security and flexibility in the provisioning of connected car services to drivers and passengers.” (Ericsson, 2016)

Department/Business Unit	Assigned number & position
Packet Core	(1) Manager
Connected Vehicle Cloud	(2) Head of Global Automotive Offerings

Göteborg Energi

Göteborg Energi is a state-owned utility company, based on the west coast of Sweden, the company offers energy services, broadband, district heating, cooling, natural gas and electricity supply network to customers. The company’s products and services are provided to both companies and individuals. Göteborg Energi looks to make life easier for the end customer by providing energy efficiently with solutions that are aimed at being sustainable and long term. District heating and “Ready Heat” are areas of energy that extend to both apartments and single family houses, for those customers whom do not have the possibility to connect to district heating Göteborg Energi offers “Ready Heat” which is heat produced locally at the customer’s premises; installation, operation, service, fuel purchases, repairs and maintenance are included in this service. Within gas, natural gas is provided by Denmark, and the company uses its subsidiary Göteborg Energi AB to own and distribute gas The business offering called “energy services” are solutions specifically related to controlling and monitoring indoor climates, the service is available 24/7 and is available over the internet. The company also has holdings in Göteborg Energi Nät AB, which owns Gothenburg’s electricity distribution network and distributes electricity regardless of the providers. Broadband is delivered by GothNet AB another of Göteborg Energi’s holdings, which controls the optical fibers network that Göteborg Energi offers in Gothenburg. Finally, Göteborg Energi aims to provide sustainable energy solutions and sees itself as a versatile energy company offering services and products for both private individuals and businesses. (Göteborg Energi, 2016)

Department/Business Unit	Assigned number & position
Göteborg Energi Procurement	(4) Purchaser within Technology

Skanska

Skanska is a global player within project management and construction. The company, founded in Sweden year 1887, has developed since then to the global position it has today covering geographic markets including the Nordic region, Europe and North America. Skanska's business operations specifically revolve around the construction and development of commercial properties, residential and public-private partnership projects. Skanska's key values, which they are committed to maintaining in all of their solutions, are creating innovative and sustainable solutions that are supported by Skanska's core values within safety, ethics, "green" sustainable building, investing in building communities along with a dedication to striving for diversity and inclusion. The previously mentioned values are all considered related to the core of Skanska's business and expertise, which serve as a moral foundation for the company and in turn are expected to be reflected in all their solutions. The company's strategy is described through "controlled growth in the construction division, a focus on developing people to create high performing teams along with close collaboration, improved operational stability, delivery on the aforementioned commitments and increased collaboration, mobility and knowledge sharing internally between units." (Skanska, 2016)

Department/Business Unit	Assigned number & position
	(5) Head of Strategy and Development
	(6) Project Director

SKF

The Swedish global technology provider, SKF, was founded 1907 in Sweden within the industry of ball bearings. Today, the company offers knowledge across 40 different industries from technology platforms within the areas of bearings and units, seals, mechatronics, services and lubrication systems. SKF describes its vision as "A world of reliable rotation", which it aims for to a wide range of different industries, automotive OEM's being one of them. The company's strategy is to create value-add for their customers through identify and offering new and innovative solutions, enable internal cost efficiency and to maximize the long-term cash flows (SKF, 2016). During 2015 a number of divestments occurred, all with the goal to enable re-focus on the core business of SKF (SKF, 2015).

Department/Business Unit	Assigned number & position
Automotive Solutions	(7) Industrial Division Controller

TeliaSonera

TeliaSonera is a telecommunication operator who offers services that help millions of people to stay connected and communicate within the areas of business and entertainment services. TeliaSonera describes their purpose in the Annual Report 2015, with the following statement, "to bring the world closer on the customers' terms" (TeliaSonera, 2015). TeliaSonera is a multinational company has its roots in the Nordics (specifically Sweden and Finland) and currently is positioned in the Nordics and Baltics as the company's primary markets. The

company offers services within mobile, broadband, TV and fixed voice with a variety of trademarks beyond the traditional “Telia” brand within the respective business areas and geographies. TeliaSonera view itself as the “knot tying together people, businesses and communities in the digital ecosystem, worldwide.” The company’s mission is to connect the world, and developing in line with the customer’s needs. Currently, TeliaSonera sees that “need” to be within the development of digitization, and the company has vowed to keep in step with the technological trend (TeliaSonera, 2016). The company’s strategy going forward, according to their homepage, is to “create the new generation telecommunications company, where networking will remain the core while entering new territory.” In response to digitization and other technological trends within M2M, TeliaSonera has set up the division Global IoT Solutions, which aims to connect everything from living room to the boardroom, from tablets to Tesla cars and from home products to business processes (TeliaSonera, 2016). *Telia Sense*, is one offering that has developed within Global IoT Solutions. The offering is a “horizontal solution” which builds on TeliaSoneras’s existing legacy offering of connectivity and further leverages the TeliaSonera brand into new industries.

Department/Business Unit	Assigned number & position
Global IoT Solutions	(8) Business Development Manager
Global IoT Solutions	(9) Partner Manager
Antoma Consulting	(10) Antoma Consultant – Partner Management

Volvo Group (Volvo IT – Telematics Division)

Volvo Group was founded 1927 (Volvo Group, 2016), today the company has over 100,000 employees, is active in over 190 countries and has production in 19 countries world-wide. Volvo Group has slimmed some throughout the years going from being an automotive producer to focusing on some specific areas within commercial vehicles and other legacy brands in the past decades. One milestone transaction that can be noted in Volvo Group’s recent history is the sale of the Volvo Car division to Ford in 1999, Volvo Cars is now owned by Geely motors, a Chinese automotive manufacturer (Volvo Group, 2016). Another considerable transaction the organization has done occurred last year when it reduced the head count of its IT division considerably. Today, Volvo Group is active within trucks, buses, engines, construction equipment and financial services (Volvo Group Trucks, 2016). The Group’s brands include: Volvo, Volvo Penta (engines), UD (Ultimate dependability), Terex Trucks hauler trucks, Renault trucks, Prevost touring coaches, Nova bus and Mack trucks. Beyond the aforementioned in-house brands, Volvo Group has joint ventures with Sunwin Bus in China, SDLG Chinese construction machines, Eicher Trucks from India and Dong Feng Trucks in China. The company divides its offerings into areas including: on the road, off the road, at sea and in the city. Volvo Group complements its vehicle and machine products with services within financing solutions, insurance, rental services, spare parts, preventive maintenance, service agreements, assistance services and IT services. In addition the company states, “The range and flexibility of the [Volvo] offering means that the solutions can be customized for each customer.” (Volvo Group,

2016). Volvo Group describes “uptime” as one of the key profitability drivers attached to its offerings within for instance preventative maintenance, this term. Volvo Group Telematics is a division within Volvo IT that works with providing internal and B2B telematics solutions to fleet managers and automotive OEMs. The division provides telematics solutions to Volvo Trucks in order to create more predictive maintenance, enhanced driver safety and many more telematics based solutions that provide both operational efficiency and other benefits to fleet owners.

Department/Business Unit	Assigned number & position
Volvo Group Telematics	(11) Solutions Area Manager – Vehicle Connectivity (12)Department Manager Solution Delivery, Supplier Manager

6. Empirical Background

The following empirical background is provided to give a snapshot of current industry settings of the case companies. This chapter is written from an industry and “IoT as a technological and business trend” perspective. The chapter begins by giving a quick overview of how various consulting firms view the implications of IoT on organizations at large. The overview is then followed by specific industry-related IoT overviews, which gives an insight into how each industry is currently being affected by the Internet of Things.

6.1 IoT and impact on every industry

The internet-of-things, originally known by many as the “machine to machine” age, is a technological phenomenon that has been on the priority list of management and organizations for at least a decade. The era of connected devices, big data transfers and more has been made possible by, amongst other technologies, *information technology*. According to sources such as McKinsey, Ericsson, CapGemini, PWC and more, this impact of the IoT technology wave can be of great proportions both as a tool to increase operational efficiencies as well as radically changing the business model of firms cross industries through its affect on value offerings amongst other aspects of the firm core (Bughin et al., 2015). McKinsey recently carried out a report, *Unlocking the potential of the Internet of Things* (Manyika, Chui, Bisson, Woetzel, Dobbs, Bughin & Aharon, 2015), where the central finding was that many have, in fact, understated the impact of IoT.

The IoT solutions that have proved to provide greatest value are rather optimization and prediction offerings with IoT applications. McKinsey’s further makes a point to highlight that business-to-business (B2B) applications of IoT can create more value than pure consumer applications, contending that B2B uses can stand to generate an estimated 70 percent of the USD 11.1 trillion economic impact that IoT is estimated to have per year by 2025. The economic impact of IoT is clearly outlined by the research carried out by McKinsey. Manyika et al. (2015) highlight that IoT is still in the early stages of development, stating, “The Internet of Things is still in the early stages of growth. Every day more machines, and people are being equipped with networked sensors to report their status, receive instructions, and even take action based on the information they receive. It is estimated that there are more than nine billion connected devices around the world...and that the number is expected to increase dramatically, with estimates ranging from 25 billion to 50 billion devices in 2025.”

Finally, Manyika et al. (2015) propose viewing the opportunities within IoT from a “setting lens” rather than per industry in order to get an understanding of the cross-industry impact. By viewing the impact of IoT from a setting lens, such as the potential for homes and cities, the value and opportunities that are going to open to firms cross-industry become very clear. Manyika et al. (2015) outline nine settings where IoT has great potential and where there is value to be gained: *home* – chore automation and security; *vehicle* – autonomous vehicles and condition-based maintenance; *cities* – public health and transportation; *outside* – logistics and transport; *human* –

health and fitness; *worksites* – operations optimization/health and safety; *retail* environments – automated checkout; and *factories* – operations and equipment optimization.

Manyika et al. (2015) show that firms, cross-industry, are looking for opportunities within new settings where IoT can be used, even if these opportunities fall outside of their traditional “industry” boundaries. AT&T the American telecommunication giant is an example of a company that has worked to seize the “smart home security” solution with its new offering *Digital Life*, where the company specifically provides the connectivity in the solution and then has attached physical and soft products from cross-industry actors to provide a “smart” security solution (AT&T, 2016). Capgemini (2015) highlights that incumbent firms within their industries can often be slow to response to such signals that IoT is sending for the firms to be responsive to the major causes of slow response to IoT by firms is outlined by Capgemini are: complacency, fear of cannibalization of existing products and services, lower margins in the transition from traditional to new offering, internal resources unaligned with opportunities and that organizations have slow decision cycles. It is clear that IoT provides opportunities for both incumbent and new players, however, both internal and external factors, such as the novelty of IoT, mean that the paths and roles of players within this environment are not yet clear.

6.2 Industry snapshots

Utilities

According to Ericsson (2015), the utilities industry will see distribution network automation and self-heating networks as a result of the internet-of-things (IoT). The potential of IoT is not new for utilities industry; such technologies have been applied for a long time to control power grid communications between different devices and remote reading of customer usage. Ericsson emphasizes that IoT will come to have a major impact on the utilities industry in the near future, although due to heavy regulations the pace of change is still merely evolutionary rather than disruptive (Ericsson, 2015).

Telecom

The transformational impact of IoT continues to drive telecommunications operators’ most critical strategic and operational decisions. This trend governs how telecom companies try to monetize their infrastructure investments and exploding data traffic, boost newly needed capabilities, rationalize their product and service offerings, improve the customer experience, and evolve their asset portfolios and business models (PWC, 2015). There are plenty of digital growth opportunities for telecoms within the realm of IoT, as profitability pressure persists across information and ICT, IoT and demands within cloud services (EY, 2015).

Construction

Differentiation is the name of the game for construction companies going forward, according to PWC’s *2016 engineering and construction industry trends* report, (2016), “No matter what path E&C firms decide to take in order to escape the commoditization trap — whether through better technology, new geographies, augmented services portfolios, or fresh talent — success will be

determined by those who can differentiate themselves from the crowded pack.“ Now more so than the previous three years managers within the construction industry foresee technological advancements as one of the most impactful trends on the industry this coming year (PWC, 2016). The industry in general can be viewed as a slow adopter to new technologies, however in the face of cost cutting pressures, the industry is turning to digitization tools (such as 3D printing and drones) and software-like thinking (project modularization and standardization) to increase internal efficiencies (PWC, 2016 & McKinsey, 2015).

Manufacturing

The manufacturing industry is currently facing the Industry 4.0. PWC (2015) defines Industry 4.0 as the next phase in the digitization of the manufacturing sector, driven by four disruptions: the astonishing rise in data volumes, computational power, and connectivity, especially new low-power wide-area networks; the emergence of analytics and business-intelligence capabilities; new forms of human-machine interaction such as touch interfaces and augmented-reality systems; and improvements in transferring digital instructions to the physical world, such as advanced robotics and 3-D printing. These changes and many others like them are sure to be far reaching, affecting every corner of the factory and the supply chain for manufacturing firms. The pace of change, however, will likely be slower than what we've seen in the consumer sector, where equipment is changed frequently (PWC, 2015). McKinsey (2015) outlines how IoT can change the business model of manufacturing companies through the application of sensor data. Sensor data on machinery can enable manufacturers to charge by usage on for instance an hourly basis. When manufacturers machinery have sensors, manufacturers go from selling pure goods to selling products-as-services because in line with offering the product, a service will be included based on offering periodic upgrades in the form of software updates.

Commercial Vehicle

Premium trucks will increasingly be connected — that is, linked to the Internet in hubs that aggregate details from on-truck monitors and allow more sophisticated forms of monitoring and control. The connected truck concept contains attractive features for fleet owners and for drivers, because it enables fleet management to be streamlined considerably, with truck data exchanged wirelessly on the move. This enables fleets to optimize logistics, availability, and costs. Through real-time traffic information, for example, mobility management can transport goods faster, more safely, and more cost effectively. Vehicle management systems support drivers in minimizing vehicle operating costs and increasing driver comfort — for example, through a detailed vehicle status display or transmitting usage data (PWC, 2015). In an industry report carried out by AT Kearney, called 'Global Truck Industry Perspectives Toward 2030' (2014), it is stated that business models of commercial vehicles will be subject to the pressure of differentiation to generate superior profits. Global setup, scale, levels of value add, product positioning, and industry segment coverage offer substantial opportunities to increase competitive advantage. The objective is to become a nimble regional and global truck maker rather than a one-size-fits-all global behemoth. A focus on regional markets will also help cushion against the global market's

broader cycles. Global parts suppliers are destined to become closer partners and furnish regional and local OEMs with the right parts for each region.

7. Empirical Findings

The following empirical findings chapter is specifically dedicated to relaying the information gathered from the interviews held with each case company. To investigate how companies currently view their firm boundaries, the chapter covers the areas in the conceptual framework. The answers are described in text-format and finally summarized in tables, to make it easily readable.

7.1 Responses to strategic issues, strategic trade-offs and tactical considerations

E.ON

When asked what E.ON's current make-or-buy strategy is, the interview candidate (1) says that at the top they decide make-or-buy, where they take one step back and ask "what core values must we have to deliver value to the customer?". So, the first consideration is what will E.ON's core value be to the customer," what are we delivering to the customer?" The interviewee states that the company has a very thorough strategy with regards to make-or-buy, where the company focuses on sourcing the majority from the market to reach specialist competencies. When asked what the company make or buy, the interviewee highlight how E.ON is supposed to lead projects and build better electrical networks, which in turn means that they source from contractors to build electrical lines and other parts of the projects. When asked about the strategic trade-offs, the interviewee at E.ON highlights that as E.ON works as a 'sourcing' company, it is such a huge part of what they do. The interviewee emphasize that a risk for E.ON is that there must be a market for what they need to source, and that it can happen that there might not be any supplier with the competency needed. However the interviewee does highlight that risk with sourcing may increase if not specific contracts can be compiled, and then it might not be worth externalizing that part of the business. Furthermore, when asked what their key considerations are within the decision, the factors they consider when deciding make-or-buy is cost and risk driven. By risk-driven E.ON identify the risks associated with the business and what is needed to maintain the value proposition. If we say that our job is to make sure electricity is available 24/7, then we have to ask, "what is needed to avoid electrical shortages/ downs etc. and what do we need to do to ensure that this doesn't happen?" The more business critical it is and the more risky it the more likely it is that E.ON will want to have control over the risk. According to the interviewee, the projects have many facets and parts, which vary, and they go to the bottom of the project and then they bring the scope back up and they consider how/where they are going to purchase different materials and parts. The interviewee also highlight how E.ON uses their scale economy to push for better prices in the market, and turn to the supplier network whenever possible to pressure prices down.

Ericsson

Packet Core

When asked about the current make or buy strategy of Packet Core, the interview candidate (2) from Ericsson highlights how the division currently stands at a breaking point, because they used to do everything on their own. But today they just do that hardware that specifically makes a difference for the whole product, where they want to differentiate themselves towards the customer. When asked about risk with sourcing, the interviewee from Ericsson states that the division wants to keep a certain level of control of their business. Another risk they consider is the risk of becoming too dependent on one supplier, and as such they show their suppliers that they have options so that they cannot take any advantage of Ericsson PacketCore. Furthermore the interviewee points towards supplier specific risks, such as bad financial health. Such risks are mitigated through an internal signal system for re-evaluation of suppliers as well as continuous re-evaluation considering: performance, delivery so far, financial strength, personnel turnover and more. When asked furthermore what they source and what they make in-house, the interviewee highlight how the company knows how to do most things with regards to their offering, but sometimes they do not have the capacity to deliver it by themselves, and that capacity usually determines the decision. It is very rare that the division buy something just to enhance their competency, or to reach new competencies. The components source are those not within their core domain or core competence, the components with limited/low strategic value. The division has methods for how to identify those areas that are core or non-core, and they look at all the products and we break these products down into components. Furthermore the components are evaluated based on strategic value and internal capacity at that moment, as sometimes their capacity is limited by organizational reasons that then would force the division to source externally. “Strategic value entails an important future, revenue bringing area, where the division wants to excel at and be able to differentiate against competitors. Ericsson wants to be seen as thought leaders.” (Ericsson interview candidate (2))

Connected Vehicle Cloud

With regards to make-or-buy decisions and strategic issues, interview candidate (3) at Ericsson CVC specifies how Ericsson has a vision of being technological leaders, which the company now not only want to be in their traditional industry of telecom but also in other industries such as IoT. According to the interviewee, the telecom market is consolidating with pricing pressures, which drive down margins, as such Ericsson needs to complement its base offerings to reach new markets and industries and survive in the long-term. The company also has a 50bn vision goal of ‘connected homes to things from things to people’, which is driven by the need/demand for mobility, broadband, cloud. In other business areas of Ericsson than CVC, the make-or-buy decision is much sharper on what can be sourced or not. At CVC, they develop assets that are ‘higher’ up in the stack and usable in different industries, and much more service-oriented than Ericsson’s traditional offerings. The interviewee specifically works with packaging solutions both horizontally and vertically, where he states “It’s the combination I think is interesting, where we can package and use cross-industry competencies that are relevant in the

transformation of IoT”. Within the new area of IoT different considerations within the make-or-buy decision are likely to appear and the interviewee specifies how it is already clear that the CVC division is much more open to partnerships for example. With regards to strategic trade-offs, the interviewee highlight that for the CVC division not everything is clear today with regards to firm and industrial boundaries, however the company strives to deliver new solutions and emphasize that it can be everything from delivery capabilities, collaboration opportunities and market position towards the customer that are considered. Furthermore the main reason CVC looks externally is to reach specialist competencies within their ecosystem, and argue that they see a trend that they are going to need more collaboration going forward in order to be able to compete with new solutions.

Göteborg Energi

When asked about make-or-buy strategy, interview candidate (4) at Göteborg Energi begins by emphasizing that they are a state-owned company, with a board that is politically controlled and fall within specific laws that regulate public procurement with regards to make-or-buy decisions. Being in the energy supply sector, the laws are set from the EU, who specifies how procurement should be done. When asked what they make-or-buy, the interviewee highlight how Göteborg Energi make a lot on their own with regards to their core business, which is production/distribution. The company prefers to buy services that are outside of the area of energy production, as they want to hold on to the things that they have a competence in and that correlates to their core business. The company supplies heating, electricity, gas, and they have their own production sites. Furthermore, the interviewee highlights how the company would never source anything that would reach the end-consumer. When asked about trade-offs in the decision, the interviewee highlight how they aim to narrow down competence-base, to make the organization less competence-intense as this is costly in the long run.

Skanska

When asked what Skanska’s make-or-buy strategy is, the first interview candidate (5) highlights how it is determined on what kind of solutions the company can provide, and how any strategy should mirror what is happening in society. The second interview candidate (6) further outlines how Skanska’s core competence is project management that their business is about leading their projects and not as much about doing the groundwork themselves. As such, their project management would never be sourced externally. Furthermore, the company holds internal competence in all areas related to groundwork in their projects at a base capacity level, interview candidate (6) adds. Hence, when asked what the company makes or buys, the interview candidate (6) highlights how they both have external suppliers as well as their own skilled workers related to construction. When asked what determines the make-or-buy decisions at Skanska, interview candidate (6) states that Skanska takes a broader strategic scope, looking at what their strategic competencies are and where they are heading: long-term strategies that are taken into consideration. Furthermore the second interviewee highlight how the company sometimes thinks it might be too “general”, when they maybe rather should be more specialized.

They do not need to be good at everything, but rather specialists within certain areas of their business (Interview Candidate (6)). Such a specialization objective has laid the foundation for their business plan going forward, according to interview candidate (6). With regards to strategic trade-offs, interview candidate (5) from Skanska highlights that Skanska weighs the trade-offs between doing a part of a construction project themselves “in-house” or let an external supplier do it. The interview candidate gives an example of factors they may look over in a decisions, the candidate goes on to say that “Skanska might be better technically and faster, however sourcing can achieve the same if there are strong contracts and legal bindings.” Another consideration in regards to sourcing is Skanska’s values, these are critical and suppliers need to be committed to the same commitments as Skanska, to make sure that all of Skanska’s values are reflected in all their projects (Skanska interview candidate (5) & (6)). Interview candidate (6) reflects upon risks with becoming too specialized, when asked about the risks associated with sourcing. The candidate states that, “when you start changing the internal resources and capabilities of the company you may lose the culture and image that is related to the business of Skanska.” This is an aspect that is taken into consideration when taking the make-or-buy decisions at Skanska, and especially when considering maintaining both project management and construction internally, the interview candidate (6) mentions. Furthermore, core competencies need to be identified or [the company] may risk losing these when you begin sourcing extensively, the interview candidate states.

SKF

When asked what SKF Automotive’s current make-or-buy strategy is, interview candidate (7) states that if we were to go back in time, back then SKF used to do everything themselves. Along the years up to the 1980s, SKF made the decision to withdraw from their steel making business, which was a huge part of their business then. Such a divestment decision the company is very happy with today, considering the huge overhead costs. On a broad scope, the SKF Group is constantly balancing having too many business internally that make the company incumbent to the other extreme where they sometimes feel that they have sourced too much. The interviewee from SKF points towards different risks when asked the question of risks with sourcing. The main point highlighted is how there has been a discussion at SKF Automotive with regards to competencies, and although a component might be a candidate for sourcing, it is important to maintain competencies with regard to all components in-house. Such a strategy is important to be able to stay at the frontier and to design the next generation product (Interview candidate (7)). As such, SKF has decided to keep design department in-house to mitigate such risks, as through such an action the designer must understand how each component play into the different products considering their design and functionality. Furthermore SKF interview candidate (7) highlights how the company evaluates fixed costs as a key trade-off, and how the whole company is always balancing having sourced too much or too little, as they are a cyclical company they need to have shorter value chains to better survive tough times. When asked what they currently make or/and buy, the interviewee states that they keep components in-house that directly contributes to a competitive advantage, and if someone else can make the component

just as well, the division source that component. When asked what other key considerations is incorporated to the make or buy decision, the interviewee highlight that it differs depending on what the component is. Sometimes the components are complex and unique, and sometimes the decision may just be based on the depth and breadth of possible suppliers.

Telia

In response to the questions associated with TeliaSonera's make-or-buy decisions, interview candidate (8) responds that "it depends which business area the decision is connected to," adding that "Telia has a natural role providing connectivity" but in other areas that they are pursuing, the role is not as obvious. Interview candidate (8) begins by stating "We [at Telia Global IoT solutions] do not really think in terms of "we do this, not that. If you look at the fact that we want the connectivity part as much as possible, then we know we want this. But when you look at the home, for example, then we know that not all homes are connected by the use of Telia's connectivity, hence we would need more partner solutions to find how we could make our position on top of existing actors there." The candidate goes on to say that, "It is quite a different playing field from the traditional sense as everyone can participate. Although, it is unclear where it will lead, we want to be along for the ride, seeing IoT as an opportunity for Telia." The second candidate (9) within the IoT solutions division makes an additional comment on how the decision is made on a project-by-project basis and it is not specifically bound by any strategy of TeliaSonera. In regards to what the company sources today, interview candidate (8) responded that the TeliaSonera "legacy offerings" are carried out in-house. The interview candidate goes on to say that within the Global IoT Solution "We cannot carry out all our ideas solutions on our own. We believe in ecosystems as a way to gather specialists and specialists within different areas to make it easier to provide future solutions. So you use the specialists within our ecosystem in different roles [sometimes as partner, sometimes as supplier] depending on the offering." Interview candidate (9) relates the question to TeliaSonera's *Telia Sense* offering by saying that, they [at Telia Global IoT solutions] "do some tests in different directions, and sometimes we do 'make' through acquiring the other party involved in the solution, as we did with Springworks in *Telia Sense*, because we believe in that area. IoT-related decisions are easy to sell within TeliaSonera presently, as it is an area where we see a lot of potential."

Interview candidate (9) adds to the discussion by speaking from the perspective of the *Telia Sense* offering, and states that TeliaSonera is not specifically motivated by fronting all their solutions. By this, the candidate exemplifies his point by two business scenarios: "In all Tesla cars, they use Telia, however this is not known by every Tesla driver, what is important, in this case is that Tesla trusts us [TeliaSonera] and that we provide the best connectivity. In Volvo it is the same thing, who provides the connectivity is less important for customer. It is under the surface. With *Telia Sense*, however, it's a different story, we want to front that we are selling something other than connectivity; and we do this by lifting our partners forth more in this case." Along with this example, interview candidate (9) mentions that another important consideration is time-to-market, and that if for example Telia would have been faster they would do the part themselves, but this is

not always the case and as such they source externally. The consultant from Antoma, interview candidate (10) who has helped shape Telia’s IoT Expert Network and Partner Program, also states that Telia has chosen to source externally primarily based on a need to gather competence and legitimacy in the new IoT solutions. The urgency in time-to-market of competitive solutions makes the IoT network a helpful tool in connecting Telia with the right actors within IoT and keeping them up to date on the developments within IoT, the consultant mentions.

In addition, according to the external consultant from Antoma (10), one of the risks considered when engaging in sourcing is that if partners in the ecosystem behave badly, it can have a negative influence on Telia’s brand. Also, when engaging in proactivity of an ecosystem such as Telia does with its IoT Expert Network, the actors involved promise Telia exclusivity. However there is always a risk that actors involved will not be loyal. As such, all parties involved in the Expert Network had to sign cooperative agreements, stating they will be loyal to Telia and the network.

Volvo Group

Volvo Group Telematics

When asked what their make-or-buy strategy is, the first interview candidate (11) at VGT states that the parameters are that we know other can do it, but then we as Volvo have a rule to “always make rather than buy”. Even in the case of telecom (connectivity), which is a key component of their offerings, the company has evaluated whether they should actually ‘make’ it themselves through acquiring an MNO. Furthermore, interview candidate (10) highlights how the company should be better at saying: “we should do this and *not* that”. With regards to trade-offs, the first interviewee from VGT highlights that there is a risk that sourcing externally may lead to disappointment in the end-offering, VGT is used to making all their solutions from scratch which means that they can customize and create solutions in line with exactly their needs. From experience, the candidate mentions that they have been disappointed when sourcing solutions before. When asked what they make and/or buy, the first interviewee highlights how they buy connectivity, which is business critical, and else they just buy less business critical components. The second interview candidate (11) adds perspective to the boundary strategy question and highlights that VGT *does* source some, and that currently the majority of what they source is commodities. With regards to the question on what the key considerations are, the second interviewee state how it depends on the components complexity and customization, if rather a commodity they source it to reach lower costs, and in other more complex cases they look at quality. Interview candidate (10) adds to the discussion by stating that that VGT is in “grey zone” as far as understanding what aspect of their division’s value offering is core, and that it is not really clear on what they should base their make or buy decisions on.

Company	Offering	Vision	Make	Buy	Strategic issues
E.on	Energy solutions & services	Provide smart solutions that contribute to a sustainable society	Projects that ensure core value to the customer	Contractors for construction of networks, services	Core value to the customer
Göteborg	Energy	Contribute to	Production and	Parts of	Core to deliver value

Energi	solutions & services	the development of sustainability in Gothenburg	distribution of electricity customer	business that do not show to the end-consumer	to customer, legal infrastructure. Core business would never be sourced
Ericsson PC	Communication networks	To be technological leader	Components that differentiates the offering	Components with limited/low strategic value	Differentiation strategy to be technological leader. Would never source core.
Ericsson CVC	Connected cloud for vehicles	To be technological leader	Service Enablement Platform	All add-ons onto the cloud	Somewhat related to legacy core, collaboration opportunities
Skanska	Project Mgmt & Construction	To be #1 in safety, quality & the sustainability	Project Management (core) & internal contractors for construction	Contractors for construction	Long-term strategy, values and vision
SKF	Bearings & Lubrication solutions	Develop new technologies for customer	Components that contribute to a competitive advantage	Components that do not contribute to a competitive advantage	Competitive advantage. Would never source anything related to core.
TeliaSonera Global IoT Solutions	New solutions within IoT	To be leading service provider within connectivity	Unclear in new solutions, if anything connectivity	Many aspects of new solutions	Somewhat related to legacy core, but it is not as guiding. Collaboration opportunities
Volvo Group Telematics	Telematics services	N/A	All most all parts of their business	Commodities, some business critical parts	Non-existing, but desire a guiding focus

Table 4. Empirical data on strategic issues

Company	Strategic trade-offs	Balancing trade-off:
E.on	Market dependency, opportunism of suppliers	Market control, pool of suppliers, clear contracts
Göteborg Energi	N/A	N/A
Ericsson PC	Loss of control, dependency on supplier	Pool of suppliers to decrease dependency Rigid screening and sourcing methods
Ericsson CVC	Delivery time, partnership potential	N/A
Skanska	Competence erosion, culture, value reflection by suppliers	Base capacity within each building branch & key suppliers for innovation and niche competences Rigid screenings to ensure standards
SKF	Competence erosion	Keep key functions in-house such as design to remain competence
TeliaSonera	Brand, time to market, partnership potential	Cooperative agreements within network
Volvo Group	Overall quality	Source mainly commodities

Table 5. Empirical data on trade-offs

7.2 Responses to views on sourcing relationships

E.ON

To gain an understanding for how E.ON defines various sourcing relationships, E.ON was asked about the organization's definition of supplier and partner respectively. The interview candidate (1) from E.ON has answered that they define a supplier as an actor that has contractual obligations to E.ON; a [supplier] delivers a product or service at a predetermined date and time, the interview candidate adds. E.ON states that they use suppliers when they source backwards in their value chain. E.ON views a partnership as a relationship that "requires more insight in each partner's financials and where the parties develop objectives together amongst other things." For E.ON, doing transactions together often does not entail a partnership, and when the term is misused it can lead to detrimental effects on the relationship because if one part sees the relationship as a partnership and the other sees it as a supplier relationship it may lead to misaligned expectations between the parts. Furthermore, E.ON has different taxonomies of existing and potential suppliers. Firstly, E.ON divide supplier relationships from a screening process that begins with basic supplier criteria to filter whether the supplier is qualified to be a supplier for E.ON. Once qualified, E.ON has key suppliers whom are key due to either their capacity and capabilities in terms of handling high volume orders or if they are business critical to how the business is carried out, as E.ON states "if they are not a huge supplier, but rather the service the supplier carries out is critical to the operations of E.ON, then the supplier is also classified as a key supplier." The key suppliers may also be a large part of *Key suppliers* are the highest level of supplier and then the taxonomies are broken down until the level of qualified suppliers and further divided into different purchasing categories. While E.ON points out that partners are not relevant in their vertical sourcing, they admittedly use "partners" in solutions such as a multi-actor project they have done called "Sustainable City", this is a diverse solution within sustainability where they work with "other big actors such as ABB and Ericsson". As E.ON states, "in these solutions we need partners because we cannot provide the solution fully ourselves."

Ericsson

Packet Core

When asked about how Ericsson looks at sourcing relationships and their perceived difference between suppliers and partners, candidate (2) stated that their product division, Evolved Packet Core, does not have partners, but that other areas of Ericsson do, the candidate then mentioned the example of a recent partnership that Ericsson made with Cisco, "where two powerful brands combined to make the partnership." When it comes to suppliers, interview candidate (2) describes a supplier as, "...A company or individual who supplies us with products or services." The candidate goes on to say, "We have different rankings of suppliers; we have two groups of suppliers: the major part of our procurement budget will be given to the so called *Preferred*

suppliers, and the rest of the budget is given to what we call *Approved suppliers*.” The suppliers who have a greater capacity are more important for us, and that determines our ranking and categorization of suppliers.” Furthermore, preferred suppliers, for Packet Core, are those actors with a global presence and large capacity, which will work for the entire operation; they can take on large commitment and are normally as large as Ericsson in size of operations.

Connected Vehicle Cloud

According to CVC’s interview candidate (3), a partner is “a larger player with whom we create something, a go to market strategy together, which we have not done in CVC, yet. We have not done this yet in CVC, on the technical side we have rather used third party solutions to provide our solutions.” However, CVC acknowledges an increased need for establishing partnerships, and especially with smaller players and start-ups with regards to their service-oriented offerings, as this is where CVC sees that the majority of innovation within IoT comes from today. Furthermore, the interviewee from CVC highlights that the company needs to create a market place, ecosystem, where smaller players such as those can work with CVC and do business.

The interview candidate (3) mentions that Ericsson has created an infrastructure with their cloud that allows players to join and Ericsson to offer a platform where customers can make use of their solution. To be able to have a working “ecosystem” as the interview candidate (3) states, “We have to work together, we have to create consent for parties to be able to do business within the ecosystem. This is to create innovation power to the end-user and the automotive OEM.” The candidate sees CVC as a platform where, suppliers and partners can come to the table and create a solution that has multiple needs and where Ericsson can come with their partner network to meet these needs. The candidate states, “We are curious as to who is developing which of the services that will go to the automotive provider. We have to build an infrastructure and consent on both a global and regional view, consent both from the innovative start-up to the eventual automotive provider who has to confirm the service being designed.”

Göteborg Energi

For Göteborg Energi, there is no current partner relationship, interview candidate (4) states, as they are not allowed to give any sourcing relationship or actor preferred treatment as a result of their position as a state-owned and run entity that must comply with strict policies of “public procurement”. Interview candidate (4) states that, “we have 1500 suppliers, and some of these suppliers are critical, which means that they are critical to our core business and solution, with these suppliers we need a good working relationship for it to work.” When deciding on whom to have as supplier, Göteborg Energi’s suppliers must fulfil the specific criteria that each case requires and the supplier is rarely chosen based on the lowest price bid, according to interview candidate (4), “there is no law that forces us to choose the one with the lowest price, therefore we often consider other more important aspects, often outlined by the EU laws in project guidance for instance, and there is nothing that says that we should choose the lowest price, rather ensure quality solution for the end customer.”

Skanska

As interview candidate (5) states, Skanska does not have a specific partner program or partner definition when sourcing vertically, however, candidate (6) adds, in more innovative solutions that are more forward looking within for instance Robotics, they have partnership solutions with for instance ABB. Also, both candidates confirm that the relationship with IKEA and the “BoKlok*” building project is also example when Skanska has use partnership in a solution that is different from their typical operations. Interview candidate (5) continues by stating, “We map all of our suppliers, and they must first meet requisites within our filters – values, certifications, ISO certifications, taxes etc. (these factors screened for in the initial qualification stages).” Interview candidate (6) develops Skanska’s supplier relationship further by describing the Preferred Supplier Program that Skanska has developed to handle their supplier sourcing relationships. The first or basic level of the PSP is the “potential” supplier and then you have the “approved” suppliers- then you have just passed the screening criteria to be a supplier to Skanska such as the financial criteria and such. “Preferred” suppliers are competitive and have a long term ambition to work with Skanska. They are divided into two categories: red and blue. Red means that we must carry out our purchasing with them when possible whereas blue means that we do not have to use them every time a job within their skill set shows up then project leaders get to choose. Interview candidate (6) further describes the highest level of supplier as “Key Suppliers, these suppliers differentiate Skanska from their competitors and they are long term in the sense that we drive projects together and we create unique value together. They are about 4-5 today, and they normally hold unique competences and have certain innovations that are intriguing for us. We create supernormal value, i.e. when we work with them 1+1 equals 4 to 5.”

SKF

When asked about SKF’s supplier and partner definitions, the interview candidate (7) from the product division at SKF states that they do not currently use partner and supplier definitions, the candidate states that “one can say that we do have different kinds of suppliers, some more opportunistic relationships while others are more long term and forward thinking.” The interview candidate goes on to state that once they have established that they can in fact source a component, they find a supplier whom is “trustworthy, competent, knowledgeable, competitive and more and for that matter if there are any such suppliers that can carry out the activity required by SKF, they even consider location as these will have an effect on lead team for example.

Telia

Interview candidate (10) from Antoma Consulting, answers the partner/supplier definition with the following statement, “In Telia’s program we differ between different types of partners. For Telia it was a more go-to-market partner program, where you rather complement each other than pure selling. In the ecosystem there are 45 partners and we use a business-oriented partner categorization which is based on how we go to market with each partner: *solution partner* (when someone from the expert network is a supplier and Telia is the only name showing), *business partner* (side-by-side services like with Telia Sense, and in this case the partner can be from the

expert network or from the outside), *reseller partner* (when someone sells for Telia, can also come from both inside or outside the expert network) and *innovation partner* (when new business development is done with a partner, can also come from both sides, it is more long-term, a mix of the others, looking into new markets and areas together).” In the “Telia Sense” solution, Telia has both suppliers that supply backward in the value chain, interview candidate describes these supplier’s contributing “from under the vehicle”, along with horizontal partners whom contribute with solutions that fall outside of the area of “connectivity” that interview candidate (8) mentions as their “core” in previous questions. We have one main supplier whom we have a very close relationship with as they contribute to a business critical part of our horizontal “Telia Sense” solution. They are such an important supplier that we have bought a 30% stake of the company interview candidate (8) states. There are certain criteria for the partners that are involved in the Telia Sense solution; all connected partners must, for instance, be interested in the data we gather, some companies just want to reach our customer base, but this is not enough to be qualified to be a partner (interview candidate, (8)). Interview candidate (9) mentions that “I am partner developer so I look at who our potential partners are, I look, for example, at our partner Folksam because they can use the data gathered from this connected car solution the “hardware” that we provide and they make use of the information gathered.” Telia has chosen to have Folksam as the insurance provider, rather than doing it themselves as Folksam is a well-known and trusted brand within insurance, whereas Telia is not a natural player within the realm of insurance, as interview candidate (8) describes. Interview candidate (10) from Antoma Consulting mentions that “We put up some specific criteria at first that needed to be fulfilled; management commitment, top level quality, good enough brand, correct types of culture, prefer Telia (over other competitors, it is not easy to reach exclusivity, but preferred is good enough.” For Telia’s partners in the connected car solution, the partners have “a shared risk/reward, economic or business models, and we also share revenues and have our own business models for the different partners” (interview candidate (9)). The partners that are in Telia’s partner program can also be found in the proactive partner network that Telia has designed to capitalize upon IoT, the network or “ecosystem” as interview candidate (10) from Antoma consulting calls it includes actors varying from technology companies to management consultants, with knowledge in tech “the purpose of the partner program has thus been to let Telia lead IoT through the help of close partners” (interview candidate (10)).

Volvo Group

Volvo Group Telematics

Volvo Group Telematics’ interview candidate (11) describes their current definitions as not completely clear, and further state that the partner definition is early in its development. They currently have one “partner” and go on to state that “telecom partner is our first partner. We had a partner for a long time, for many years, but we realized that it doesn’t work with 1 partner. We had hope for a fairer pricing etc. for the long term but that did not turn out. So from then on we decided that we need more suppliers to make it competitive.” The interview candidate states that the partner definition is based on the fact that the activity is crucial to our business and both monetarily, we work so closely with them with meetings, follow-ups and such which also that

makes them “partners” rather than suppliers.” Interview candidate (12) from the Volvo Group Telematics division describes suppliers as those whom they have transaction-like relationships with, whereas a partner is someone who they have shared objectives with. The candidate adds that in other divisions the term strategic partner entails certain activities such as partner management and the participation in certain activities. The candidate also adds “The majority of our suppliers do not go beyond an operational level of management from our supplier management. They do not have any after-market services our support for instance, and then we do not have the “business relationship” with them, just the “operational” then other relationships such as our partners, we will have additional levels of seniority and governance attached. At the highest level we have annual meetings to ensure that these partnerships are meeting the expectation of each part” to describe the taxonomies of relationship they use. Candidate (11) answers the question of what criteria sourcing relationships are based on by stating “criteria are guided by our past contracts, so we have to decide. Harder criteria means you are more tightly connected to them and you lose flexibility. And there we have the same consideration internally. The more complex, the greater the investment etc. With our partners also consider price, quality, delivery capabilities (capacity etc.)” Interviewee (12) adds to the dimension by say that the division also has a rule that suppliers must fill criteria as far as financial stability and judicial requirements for instance...[and] we have a rule that Volvo cannot be a too big part of the supplier’s portfolio, because if we want to leave them then we put the supplier in risk of going bankrupt if we are too big part of their portfolio.”

Company	Supplier	Partner
E.on	External actor with contractual obligation to deliver to E.ON	Partners to fill areas where E.ON lacks competency
Ericsson	External actor that supply parts of products and services	When two powerful brands are combined
Göteborg Energi	No specific definition	No specific definition
Skanska	No specific definition	Creates innovative, forward looking solutions with Skanska
SKF	More/less opportunistic relationship	No specific definition
TeliaSonera	External actor is white-label Also referred to as ‘solution partner’	Go-to-market relationship
Volvo Group	No specific definition	Business critical to solution, high effort put into relationship management

Table 6. Empirical data on views on sourcing relationships

8. Analysis

The following chapter contains an analysis of the empirical findings and is divided into all areas highlighted in the conceptual, theoretical framework. The results in each part of the conceptual framework are set in relation to the three existing theories on firm boundaries and IoT. The analysis is concluded with a summary and answer to how well existing theories can explain firm's view on their boundaries in light of IoT.

8.1 Analysis on each part of conceptual framework

Part I: Strategic Issues

With regards to the strategic issues considered in the make-or-buy decision, five out of eight case companies refer to a clear guiding strategy/focus. E.ON asks itself on a top management level “what core emphasis must we have to deliver value to our customers?” On the other hand, Evolved Ericsson Packet Core begins by identifying how they differentiate towards their customer. Ericsson Packet Core states that: “[By strategic value] we mean in part, that it is important, future, revenue bringing area, which we do not want our suppliers to get good at. As a technical firm we want to be seen as ‘thought leaders’, which means that our product portfolio can be differentiated towards our competitors, which is strategic value for us.” In a similar manner, SKF highlights how their specified competitive advantage guides the decision and Göteborg Energi draws connection to what is their “core business” as guiding the decision. Skanska has chosen a guiding strategy where the company has identified their core competencies to be within project management. For Skanska this means that they carry out all project management in-house while construction, the other aspect of their value offering is only carried out to only a certain degree in-house.

Four of the case companies identified themselves as having a clear guiding strategy, Skanska, Ericsson Packet Core, Göteborg Energi and SKF, further specify how they “would never source externally what is their core or related to their core”. However, the companies differ in regards to whether they source what is non-core or not, hence they differ with regards to their vertical scope. E.ON, SKF, Ericsson Packet Core and Göteborg Energi sources all that is non-core, and E.ON even goes as far as to identify themselves as a “sourcing company”. Skanska does, however, keep a broader vertical scope, as they keep base capacity internally with regards to what is considered non-core, namely competencies within construction. It should be noted that Skanska aims for increased specialization, where less and less aspects of the business are kept internally in the future, thus their scope will become more narrow.

Meanwhile, three divisions differ from the aforementioned group, with regards to strategic issues, namely Ericsson Connected Vehicle Cloud, Telia Global IoT Solutions and finally VGT. VGT expresses a desire to establish what is core/non-core, however presently it is unclear, as the company hasn't engaged in such decisions before. Telia's IoT division specify how TeliaSonera in general defines what is their “core business” as connectivity, and for the IoT division this is somewhat guiding but not a determinant of what to make-or-buy. Although Telia does have

some sort of guiding strategy, the IoT Solutions division doesn't really think in terms of "we do this and not that" as interview candidate (9) states, rather the candidate describes them as making "bets here and there." The IoT bets that the candidate describes, are made in relation to where TeliaSonera wants to be in the future. For instance, with the example of the Telia Sense offering, Telia has seen Folksam insurance company as a more natural provider of such a service and therefore has not chosen to "make" this part of their solution, rather sourced it through Folksam. Ericsson Connected Vehicle Cloud also differs from the majority of the firms in the first group in the sense that the respondent highlights that the division is somewhat excluded from the sharp, and specific guiding principles that the legacy departments of Ericsson uses in make-or-buy decisions. Rather, the CVC division, in comparison to other divisions at Ericsson, emphasizes collaboration opportunities early on in the decision instead of 'what is core'.

Neither Ericsson Connected Vehicle Cloud nor Telia IoT Solutions emphasize clear definitions on how their vertical and/or horizontal boundaries are set at the moment. Telia IoT Solutions refers to how they cannot carry out all their solutions on their own, and rather believe in ecosystems. Telia does not let the focus of the firm close doors to area of opportunity that might not feel completely natural to the company. Summarizing the outline by Telia it seems the long-held focus of the firm is challenged and Telia tries new areas that might in the future be considered core. Ericsson CVC doesn't give a clear outline on how much they have sourced at the moment, but does highlight that current scope and thus boundaries are unclear within this division. VGT does currently keep a broad vertical scope, carrying out all aspects of their value offering internally. However it should be noted that the company specify a desire to decrease their vertical scope and becoming more focused.

In summary, two group of companies unfold from the previous outline: 1) the majority of firms that have a set core that strongly guide the following decisions about the companies' boundaries and even results in that items and activities related to core are never sourced, 2) the three remaining firms that either have a challenged or unclear core in as a result of IoT and where the following decisions are not as structured as with the first group of firms. The first group of companies includes E.ON, Göteborg Energi, Skanska, SKF and Ericsson Packet Core. The second group is made up of Ericsson CVC, Telia IoT Solutions and VGT.

Theoretical discussion

The answers of the first group, in regards to strategic issues, can be explained by the existing RBV theory, where an established focus guides the following make-or-buy decisions (Prahalad & Hamel, 1990). Furthermore, the group's emphasis on not sourcing anything that is core or related to the core is specifically in line with what the competence-based view emphasizes (Prahalad & Hamel, 1990). Therefore, the existing RBV view on boundaries is usable in many of the cases when considering the first "guiding strategy" of what should be made-or-bought.

The second group, with Telia IoT solutions, Ericsson CVC and VGT, deviate from the majority, in the sense that these firms have a less relevant guiding core, or even a non-existing core. It

results in unclear boundaries for Telia IoT Solutions and Ericsson CVC, and relatively broad boundaries for VGT whom makes almost everything of their offerings in-house. Hence applying RBV in this case becomes more difficult; as it can only be used to the extent that it explains that these divisions see a core with regard to legacy offerings carried out by their firms. Applying TCE is difficult in this case as well; as neither Telia, Ericsson CVC nor VGT express that their boundaries are set based on cost minimization targets. The collaborative view(s) show a degree of application in this case, as both Telia Global IoT Solutions and Ericsson CVC emphasize collaboration opportunities as a guide rather than what is core. This is exemplified by Telia's partnering strategy for instance. The way Telia uses its network to create new opportunities for the company within IoT is exemplary of the ecosystem view by Williamson & De Meyer (2012) as the company combines relevant internal resources the company has and external resources of firms' cross-industry in their ecosystem. However, the collaborative view as a guiding strategy must be viewed carefully as the collaborative view can to some degree be seen as an extension of the RBV, where the core is clearly identified and guides what the firm should make-and-buy (e.g. Wernerfelt, 1984).

The distinction between Ericsson's Connected Vehicle Cloud, TeliaSonera's Global IoT Solutions, and Volvo Group's Volvo Group Telematics from the rest of the case companies' (group one) views on strategic issues can be explained by the role that IoT plays in each of these divisions' respective solutions. IoT is an explicit part of each of these divisions' service offerings. One explanation for the broader scope that Telia is allowing themselves in the case of Global IoT is the pressure on margins of their legacy offerings within for instance connectivity, this means that Telia feels that it *has* to look to new solutions in order to find areas where they can secure new profits to survive. Such a movement is relatable to the implications of IoT on firms as outlined by Porter and Heppelmann (2014); that state, "When involved in IoT, companies' industrial boundaries are affected, which leads to firms contemplating what business they are actually in." TeliaSonera is a clear example of a company that might have seen themselves as industry leaders within connectivity, where with the wave of IoT, connectivity rather becomes a supporting part of IoT Solutions, far backward in the industry value chain. Porter and Heppelmann (2014) further outline that when legacy offerings are challenged like this, firms can choose mainly between two alternatives: expand into related products within emerging product systems, or seek to create the platform that connects the different, related products. TeliaSonera has, through its Global IoT Solutions division, chosen to challenge its horizontal scope with new bundled products and services and move further up the IoT value chain through the use of partnerships. The pursuit of higher margins and general aptitude of companies in any industry to find their new position in the IoT setting is further exemplified by the telecom equipment provider Ericsson. Ericsson, by using the IoT enabler cloud and corresponding service offering through CVC, is also looking cross industry to compete within IoT solutions in the automotive market, in line with Porter and Heppelmann (2014). Connected Vehicle Cloud is a combination of internal and external competencies that has made it possible for Ericsson to use its cloud, a natural part of the IoT technology stack, in order to gain a

foothold in IoT. Furthermore, when Ericsson CVC outlines an increased need for partnerships to reach cross-industry capabilities, to be able to bundle and package new solutions within IoT, the interview candidate (3) speaks in line with the outline made by Iansiti and Lakhani (2014). Iansiti and Lakhani (2014) emphasize that IoT will force companies to rethink how value is created and how relationships with external parties are formed.

The third distinctive case company from the majority of the first outlined group, Volvo Group Telematics, is a division that has, since its origins, had a natural position within both the automotive and commercial vehicle software. As the Telematics provider for the commercial vehicle industry and automotive (with its Wireless Car solution), VGT can in many ways be seen as having similar drivers as Telia and Ericsson. However, VGT differs still, as the division is one of the original players within telematics and thereby IoT, the division has traditionally carried out all aspects of their telematics offerings in-house, as they have often been first-movers within the space. VGT still makes most parts of the offering in-house, and engaging in partnerships are not as much emphasized as an established practice, rather a goal that they have set to strive for. Being an early player within IoT, relations can be drawn to the outline by Porter and Heppelmann (2014) that early in the rise of IoT, few actors existed and as such the choice of whether to make-or-buy was never an issue: firms chose or were forced to 'make'. Following that note, the wide adoption of IoT however implies that the environment has changed and today many suppliers exist with specialist capabilities that should be considered for sourcing. Considering this new industry structure with more knowledge distribution within IoT the trend makes many of the focal firm's previous in-house capabilities redundant and under-performing in comparison to the new specialized actors (Porter & Heppelmann, 2014).

In comparison to the second group, the role that IoT currently plays for the first group of companies is markedly different. Within the construction industry, although they do provide a service "project management" and a product in the sense of the building, research reports show that the influence of IoT on the companies whom provide construction and project management services is currently lower and merely a tool for operational efficiency through for instance 3D printing. Although, there are opportunities such as the "connected home" and "smart city", opportunities that have yet to take form in the sense that construction companies have not found or decided upon their role in these areas. Similar arguments can be used on the manufacturing industry and case company SKF, whom are stand to gain benefits from IoT as it opens opportunities for manufacturers to change their products into services, however the potential is yet to be realized according to Bughin et al. (2015). Finally, E.ON and Göteborg Energi within the utilities industry are to a large degree governed and bound by regulations. The utilities industry is protected by high barriers to entry and to a certain extent legal infrastructure that puts them in a position to be slower adopter to the opportunities provided by IoT.

Extent of theory application

In conclusion, TCE as a key determinant in make-or-buy decisions is not relevant according to any of the case interview answers. The RBV guides the majority of firms whom do not provide

IoT related solutions. In the case of Ericsson CVC, Telia IoT solutions, and VGT one can see that the RBV is not particularly helpful as it is a static understanding of what the core of the firm *has* been or is, whereas these divisions have a focus on what their firms' position should be within IoT in the future. The collaborative view(s) are more helpful in understanding the use of networks and partner management in determining what to make-or-buy. The IoT divisions of the case companies interviewed are more likely to look to their business ecosystem and partner networks, before their core, when determining what they should make-or-buy.

Part II: Tradeoffs

The answers among the respondents with regards to trade-offs show an emphasis among the majority of firms (group 1) on three areas: competence erosion, control and dependency. Thus, apart from defining their core, these companies evaluate further considerations when determining where to draw their boundaries. Two out of eight cases emphasize dependency, E.ON and Ericsson Packet Core, and how this may affect their respective level of vertical integration and as such their firm boundaries. Ericsson specifically highlight how loss of control is undesirable for the company, and that this may in fact have an effect on how and when they source externally. E.ON specifically emphasizes that as being a 'sourcing' company, it is dependent on that a market exists out there. Furthermore E.ON specifies how they on a strategic level consider trade-offs of costs and risks when carrying out make-or-buy decisions.

Both E.ON and Ericsson Packet Core use a network of approved suppliers in order to enable non-dependency on a few specific suppliers. Ericsson may allow being dependent on a supplier for a specific division, but the company does not let a single supplier serve several divisions for the same purpose, in order to avoid lock-in. E.ON utilizes its economies of scale to put pressure on suppliers and as such control the market.

Skanska and SKF are the only two companies that emphasize the risk of losing competence when engaging in external sourcing. For SKF, some competencies are attached to components of their final product, which then could have been lost if sourced. SKF manages to avoid the loss of competence by maintaining the function of design in-house, which then assures complete control of how all components should be designed. Skanska has a similar balancing tactic against competence erosion: first of all, project management assures complete control of all construction projects and are thus kept in-house, and further Skanska still holds base capacity of all components of a construction-projects in-house. The construction company Skanska in addition, emphasizes the risk of loss of culture when becoming less vertically integrated, in the sense that it can change what Skanska has traditionally been associated with "construction" if it were to choose to wholly source this activity for instance. Such an emphasis on culture can be further connected to understand, to a certain degree, why Skanska still keeps base capacity in-house in all major areas of their value chain. Furthermore, Skanska holds on to their key values of quality, safety and sustainability, as this is how the company creates value to customers and society. Moreover, SKF highlights how the company chooses to source externally to lower their level of fixed costs held internally, to be able to meet cyclical patterns of demand. Göteborg Energi carry

out a similar discussion to SKF that the company engages in sourcing in order to keep a less competence-intensive organization, to enable lower fixed costs.

For the minority of firms (group 2), different or *no* specific trade-offs are emphasized. TeliaSonera Global IoT Solutions, Ericsson CVC, and VGT, for these divisions, the decision rather begins, for each new solution, on a project basis, where Telia first turns to their ecosystem or “network” as they call it, to find the capabilities needed. The reason for doing this is that Telia believes that legitimacy in a new solution can be enhanced through the use of external parties, ensuring that the right party is fronting the right part of the solution is a key factor for Telia. Enhanced time-to-market is also a key consideration for Telia. When an actor in Telia’s ecosystem is faster than Telia they will be allowed to make the component or carry out the activity rather than Telia internalizing the capabilities to do the part in-house. Telia always considers whether they want to be fronted in the new solution; as such the brand is an important aspect. Thus for the Telia Global IoT Solution division, current boundaries are not specifically set and will vary by each new solution. Ericsson CVC, highlights how the division see an increased need for partnerships within the new, packaged solutions, and therefore immediately turn to its ecosystem to find actors which can improve the offering through specialist competencies such as fast delivery or competencies outside of Ericsson’s competencies within IoT. This is similar to Telia’s strategy in the sense that Ericsson CVC also weighs similar trade-offs because even if they *could* invest in internalizing competencies they look first to their ecosystem and are open to partners to be able to maintain their scope and not broaden it. Ericsson CVC thereby competes *with* new solutions that use competencies from other “partners” and industries that may be found outside the boundaries of the firm. Hence, Ericsson CVC’s boundaries are varying, but with the aim to source rather than internalize if it enhances time-to-market and the potential reach of activities of the final solution.

VGT emphasizes quality as a trade-off. According to the interview candidate (11), experience has shown the firm that quality deteriorates when sourcing through the market and that they cannot customize to the extent that they would like in many cases when sourcing. As such, it has resulted in that VGT mainly sources commodities, if anything. VGT differs from the other two IoT related division in the sense that they have carried out IoT related solutions for a longer period and are one of the original actors in their field. VGT has had to build many of the parts of its solutions from the beginning and this has ingrained itself in the division’s almost “make *before* buy” culture at present, as discussed in the previous section on strategic issues.

In summary, although the outline on trade-offs is a bit more fragmented once again two groups unfold: the first group, the majority of firms that see clear trade-offs when choosing whether to internalize or source, with an emphasis on why and when they wouldn’t source, and as such has clear views on where to put their boundaries. Meanwhile, the second group, the minority of firms, do not make as clear emphasis on trade-offs against sourcing but rather argue in favor of sourcing, and that it varies from time-to-time. VGT is in this case an exception from the second group in the sense that their history of make-before-buy and thus broad scope stem from the key

trade-off of quality involved in the decision, which usually has showed that internal quality is better.

Theoretical discussion

On a strategic level companies weigh flexibility (Göteborg Energi, Skanska and SKF who consider the cyclical nature of their industries and the need to lower fixed costs); control (as for instance both divisions in Ericsson mentions when considering how much, to whom and what they should source), dependency (Ericsson Packet Core, E.ON). Dependency, control and flexibility are three trade-offs outlined in our conceptual framework and emphasized by the transaction-cost-economics view (Grant, 2010). According to Burt et al. (2003) being dependent on the market is a key risk when increasing the degree of sourcing in a firm, as the focal firm the risks falling victim for lock-in problems, where existing suppliers take control of the relationship and as such the firm. When emphasizing dependency, a firm makes a clear connection to the concept of opportunism as outlined by TCE (Williamson 1985; Fredikind, 2014). Opportunism refers to the assumption that all actors will act in their own self-interest first and foremost, and as such suppliers are expected to take advantage of a situation where they can exercise power over the focal firm. In this sense, the more suppliers available on the market, the less risk of being susceptible to dependency on one supplier, a consideration outlined by proponents of TCE; Bahli & Rivard (2003). Threat of opportunism does not limit any of the firms' engagement in sourcing, as such the TCE can only explain to a certain extent.

In line with the competence-based view, two firms emphasize competencies as a key trade-off, Skanska and SKF who value competencies highly and something they don't want to risk losing. Proponents of the competence-based view, Espino-Rodriguez and Padrón-Robaina (2006) argue that too much sourcing may erode off new competencies that otherwise might have been learned, when the scope of the firm becomes more narrow. However, it should be noted as outlined by Wernerfelt and Karnani (1989), that when narrowing boundaries, the firm might actually improve its learning curve within the activities and items kept internally. The only company that specifically shows similarities to the outline by Wernerfelt and Karnani (1989) is Skanska with their specialization objective that claim that they do not need to be best at everything.

The three outliers from the majority are once again Telia Global IoT Solutions, Ericsson CVC and VGT. These firms emphasize different trade-offs considered and key determinants on where to put firm boundaries than those outlined in RBV or TCE. Furthermore, Ericsson CVC and Telia Global IoT Solutions emphasize collaboration potential. Such a result refers to the results within the category of 'strategic issues', that these divisions are highly involved in IoT, compared to the other case companies, and whatever has been the respective companies' core focus and value proposition is now challenged, relatable to the impact of IoT (Porter & Heppelmann, 2014). The emphasis on collaboration potential is relatable to the collaborative view(s), which argue that flexibility can be reached through sourcing if ecosystems are managed proactively. Aspects such as time-to-market and partnership potential become important aspects that result in strategic implications for the make-or-buy decision in line with the emphasis by

Porter and Heppelmann (2014): that sourcing externally should be preferred when involved in IoT as it can lead to reach of specialist capabilities. VGT's emphasis on make-before-buy to keep up high quality of solutions is once again related to the outline by Porter & Heppelmann (2014) that early players in IoT were forced to perform most parts in-house. However the authors also proclaim that this is now changing, when IoT grows in spread.

Extent of theory application

TCE is highly relevant to explain trade-offs involved in make-or-buy decisions on the majority of the case companies within group one, with regard to vertical integration versus sourcing (the other side of the paradigm), TCE can be helpful in explaining the view on boundaries of the firm. However, the TCE is only relevant in explaining the trade-offs involved in make-or-buy decisions for the five case companies whom are, from an industry point of view, not providing IoT related solutions. TCE is therefore only relevant to a small extent, mainly in a general vertical sourcing discussion and when companies are not facing great uncertainty. Even E.ON, who does consider the firm vs. the market when sourcing vertically in line with TCE, couple other strategic considerations such as a "core view" and "business criticality" when taking make-or-buy decisions.

Although the RBV can be applied to two of the cases, the theory does not, like TCE, cover all the tradeoffs considered by the case companies. What can be said is that each view contributes in their way to the understanding, but the case divisions with IoT related solutions do not bring up either TCE or RBV related discussions when considering trade-offs. Rather these companies emphasize in a similar manner to the collaborative view(s), reaching for flexibility in terms of create new solutions fast and deliver them fast to market. Therefore the collaborative view can be used to understand the tradeoffs weighed by the divisions competing with IoT related solutions.

Part III: Sourcing relationships

Within the area of sourcing relationships, questions were asked about supplier and partner definitions and criteria and rankings of existing and potential relationships. With regards to supplier definitions, aspects such as "an actor that has contractual obligations to us" (CO), "backward sourcing in the value chain" (CO), "an actor who supplies us with parts of products or services" (Ericsson Evolved Packet Core) and "an actor that is white-label in our solution" (TeliaSonera) shows that suppliers in the vertical value-chain are seen as white-label suppliers in the transactions in the eyes of the aforementioned case companies. Göteborg Energi, Skanska, SKF and VGT do not give a specific definition of supplier. Rather these companies highlight the need for a proactive way to manage their external sourcing relationships. To note, VGT is are considering the importance of supplier and partner definitions within the question of relationship management. VGT highlights its desire to find a definition because they hypothesize that it is important in taking make-buy decisions and coupling the correct sourcing relationship.

With regards to partner definition, two different definitions have come forth throughout the empirical data. The characteristics of "innovative solutions that are more forward-looking" (Skanska), "where two powerful brands are combined" (Ericsson Evolved Packet Core), "where

the parties develop objectives together amongst other things” (E.ON), have been uttered by a some of the interview candidates. The aforementioned characteristics point toward a partner being an actor that aids in creating new solutions spanning the companies’ current “horizontal” scope and where the two brands are combined, and high effort are put into maintaining the relationship. In reference to the horizontal scope, it should be highlighted that TeliaSonera, Skanska, E.ON, Ericsson CVC and Evolved Packet all describe partners as relevant for new solutions, even if they do not see their respective division as currently in partner relationships. When discussing partner definitions, Telia becomes an interesting case, as they go as far as to say that any actor that is integrated to Telia’s solution, whether they are white-label or side-by-side with Telia to the customer, as a partner. As such, Telia refers to suppliers as “solution partners”, and when they go side-by-side, meaning both brands are showing to the customer, the external actor are referred to as a “business partner.” Telia’s definition of a business partner is similar to the definition of a partner given by Ericsson, Skanska and E.ON.

Two distinctive cases are SKF and VGT, where SKF once again highlight that they do not have a definition with regards to what a partner is. Meanwhile one of VGT’s respondents highlights how “the partner definition is based on the fact that the activity is crucial to our business and with high monetarily value, we work so closely with them with meetings, follow-ups and such which also makes them ‘partners’ rather than suppliers.” In this sense, the partner definition is similar to other definitions with regard to high effort put into maintaining the relationship, however in VGT’s example, the partner is white-label in the solution, and as such differs from the definition given above that a partner will show their brand in the solution.

The second area of research with regards to sourcing relationships refers to the interviewed case companies current criteria, function and management of the relationships. From an overview of the empirical data, five out of eight cases argue that they have different taxonomies with regards to suppliers and partners, taxonomies that are connected to the criteria the companies put on suppliers and partners. E.ON, Skanska, VGT, and Ericsson PC have so-called supplier programs, where existing suppliers are divided into either two or three categories. Interesting to note, is that Skanska’s view on their Key Suppliers is almost that of what many other case companies definition of a partner. A key supplier for Skanska is someone whom often helps the company differentiate themselves with innovative solutions or niche competencies. Ericsson Evolved Packet Core mentions a similar view on their Preferred suppliers whom, beyond holding high capacity, may also contribute as a differentiating factor for Ericsson PC. In comparison, Telia Global IoT Solutions has set up a Partner Program instead of a supplier program, something that goes hand-in-hand with the fact that the division refer to all external relationships as ‘partners’. The program is initiated anytime a new solution is formed, and it can either be through ideas coming from the IoT Expert Network Telia has set up, or from other external parties as with the case of Telia Sense. Ericsson CVC, although not much engaged in partnerships yet, emphasize how they in a similar manner as Telia need to create an proactive network within their ecosystem, to enable more partnerships.

In summary, some companies showed clear distinctions between partners and suppliers. Although they do not define their suppliers as anything similar to a partner, it becomes clear that some view some of their suppliers in a similar manner as to how they view partners. All of the companies use different criteria as approval for becoming a supplier to them based on their objectives with sourcing. It is clear that management of sourcing relationships is evident in all the case companies' reflections to the supplier and partner questions. Yet, the degree to which they use suppliers and partners seems to differ depending on the objective. One could say that suppliers are a natural relationship that companies utilize in vertical sourcing, whereas "partners" are the natural choice for horizontal sourcing relationships when companies are looking for new competencies, from other industries, to offer new solutions.

Theoretical discussion

Ericsson Packet Core and SKF's use of suppliers as almost purely "arm's length" transaction with nuances of preference can be related to the arm's length transactions by TCE that Grant (2010) outlines when considering the sourcing relationship taxonomies that often arise in the vertical value chain. Both case companies outline that they have the competencies to carry out most tasks internally, however when the tasks fall outside of their focus areas then the companies choose to source these to "suppliers" as they have explicitly stated.

Considering that many of the empirical interviewees mention that they are looking for sourcing that delivers "1+1=3" value, they show collaboration thinking as outlined by Dyer & Singh (1998). The majority of interview candidates describe their sourcing relationship in line with those given by Chesbrough's open innovation which emphasizes the value that can be created through a network of partners and the benefits with such "alliance" thinking. Telia's partner program shows very clear tendencies to the collaborative view(s), fundamentally Telia Global IoT Solutions division looks beyond its existing competencies to create unique value with its partners, which is characterized by knowledge exchange (Dyer & Singh, 1998; Chesbrough, 2003) and highlights the unique value a partnership can make when both parties invest in the partnership and jointly create unique, new products as outlined by Dyer & Singh (1998). The partnerships Telia has forged for its Telia Sense solution are of combined branding strength and complementing technologies and industry know-how. When looking closer at the value gained from the Telia IoT network, it is clear that similar to Chesbrough's (2003) open innovation perspective and that of Dyer and Singh's (1998) relational rents, emphasis is on the value created by the entire ecosystem and partnerships respectively.

It is intuitive that the collaborative view(s) becomes imperative for firms such as Ericsson CVC and Telia Global IoT Solutions whom face fast-moving industries where "what is in one day, can be out the next", which means that time is a critical factor that these companies face when delivering their offers. Organic internalization is hardly an option for these companies when it comes to coupling new competencies and cross industry capabilities in the new areas of IoT for two reasons 1) turning to other actors to partner are often faster than either organic or M&A internalization and 2) as IoT is a new area which challenges the existing core of the companies it

is not sure that initial full blown investments in uncertain territories are the best answers, especially when there are existing actors whom currently specialize in specific areas of IoT. The uncertain environments these case companies find themselves in requires “cross industry capabilities” as Manyika et al. (2015) point out. These results are in direct contradiction to the RBV emphasis on acquisitions when new core competencies are needed (Wernerfelt, 1984).

Skanska, E.ON, and Göteborg Energi and SKF are clear examples of incumbents in industries that, today, do not have high technology turnover and thereby is not currently experiencing IoT as a huge pressure on their value offering. In comparison to the specific IoT divisions, who particularly emphasize partner programs and ecosystems needed to be managed proactively, Skanska, E.ON, Göteborg Energi, Ericsson PC and SKF do not put the same emphasis on partnerships as may be proclaimed necessary within IoT (Manyika et al., 2015) However, this is not to say that these companies do not make use of supplier programs and collaborative view(s) on their sourcing relationships, as they do see the additional value that can come from supplier management programs, in line with for instance Dyer & Singh (1998).

Extent of theory application

When reviewing the responses to sourcing relationships in comparison to the existing theoretical views on boundaries, the TCE view helped only to a small extent in explaining the types of sourcing relationships that some of the case companies used when sourcing (Ericsson PC and SKF). Beyond the TCE view, RBV, which is a proponent of acquisitions before partnering also proved difficult in applying to any of the cases. The collaborative view(s) on boundaries in general proved more helpful in explaining how the case companies viewed their sourcing relationships as every case interview candidate mentioned, to some extent, the value that can be gained from managing sourcing relationships in the make-or-buy decision.

8.2 Summary of analysis

The previous analysis on all parts of the conceptual framework has shown that the three existing theories on firm boundaries; transaction-cost-economics, the resource-based view and collaborative view(s), show varying degree of application.

Three of the investigated companies have differed from existing theories with regards to consideration of strategic issues, trade-offs and sourcing relationships. Less relevance is given to strategic issues of guiding core, different trade-offs are considered, and furthermore the three firms emphasize the capabilities of actors in their ecosystem as a key consideration early in make-or-buy decisions. The analysis showed that although all companies are impacted by IoT and given a number of opportunities within the fourth IT-driven wave of transformation (all set in the context of IoT), we found patterns of increased involvement in IoT by the three outlying firms. The divisions belong to the following companies: Global IoT Solutions to TeliaSonera, CVC to Ericsson and VGT belongs to the Volvo Group. Neither of these divisions is considered traditional, legacy offerings to their respective companies, they are rather sub-units supposed to be more involved in IoT. Meanwhile the majority of firms, for whom the three theories explain to a larger extent the view on boundaries, refer to their existing solutions/legacy offerings, which are not particularly involved in IoT. Therefore, we begin by claiming that the level of involvement in IoT can explain the difference of theory application between the two groups of firms.

The TCE is helpful in understanding strategic tradeoffs when considering vertical integration versus sourcing for the actors whom are in a state of “business as usual”, which is for the majority of firms. However, as a determinant for the boundaries of the firm in an environment being changed by IoT it is less relevant. TCE compares the firm versus the market and views boundaries as mainly driven by transaction costs tradeoffs that are considered in an opportunistic setting. This contrast as to the firm’s role in its business ecosystem and the opportunities associated with sourcing relationships that go beyond “arm’s length transaction” is therefore neither relevant nor helpful for actors that are looking to compete with IoT solutions. These actors first consider the market or “business’ ecosystem” as a source of value and competitive advantage instead. While cost minimization is one aspect of the general focus of a firm it is hardly the driver of the strategic decisions for any firm within IoT at the moment, as due to its nascence, uncertainty and potential could be completely missed if one were to attempt to quantify the associated risks.

The RBV has proven to be helpful only when the case interview candidate is in a division that is not related to IoT solutions. This can be explained by the fact that the core view is helpful when the core is clear and easy to identify. However, in the case of IoT divisions where the divisions are making more or less bets on what they “think” the value offering should be and the core or key differentiator is not completely clear, the RBV view proves unhelpful. In addition, RBV proposes that items or activities that are considered “core” should be internalized, even if these

are new cross-industry areas the RBV argue for integration through for example M&A. In line with the proposed critique in our theory problematization, the idea to identify core and let it guide might be too stale in a dynamic environment where things can change over night. The increased uncertain environment IoT currently creates forces involved companies to rethink their previous idea of what is core. IoT involved firms may need to source areas of the offering that is core and find another way to gain value from their part in the solution as for instance CVC which is an enabler platform and cloud infrastructure, where other parties contribute with the parts of the solution that differentiate it towards the customer. The same can be said for the Telia Sense Solution where Telia provides the connectivity that enables the solution, yet has not fully internalized Springworks to provide the solution, nor have they chosen to offer the insurance connected to the offering (another differentiation factor of the offering). Furthermore, the RBV as a methodology to “focus” a firm is questionable view to have in such an exploratory field as the nascent IoT where it is not clear who will do what with the opportunities available. A company that does not allow itself to explore new opportunities with a loosened understanding of the core may miss the opportunity completely.

The collaborative view(s) has proven especially helpful in understanding the view on firm boundaries for the companies more involved in IoT. The emphasis on sourcing relationships and ecosystems as a source of competitive advantage is seen for both Telia Global IoT Solutions and Ericsson CVC, and although not applied it is implicated by VGT as a new aim. However, the original collaborative view(s) argue in favor of still keeping a stable core within a firm, thus firms involved in IoT now challenge this particular aspect, inline with critique in our problematization and connected to the outline above on core.

The results of the traditional theories application among the firms more involved in IoT have been summarized in the following table. Thereafter, a summary of how these firms view their boundaries are outlined to point towards a new understanding of firm boundaries.

Factors of make-or-buy decision	Extent to which theoretical views can explain the IoT related firms' views on their boundaries		
	TCE	RBV	Collaborative View(s)
Strategic Issues – guiding view to determine boundaries	-	-	-/+
Trade-offs that influence boundaries	-	-	-/+
Sourcing relationships, role in decisions	-	-	+

Table 7. Extent of application of existing theories on IoT related firms' view on their boundaries

8.2.1 Towards a new view on firm boundaries as result of IoT

The collaborative view(s) outlined in the theoretical review of this thesis has proven the most helpful in explaining how firm providing IoT related solutions view their boundaries. However, IoT implies additional implications on boundaries that are not highlighted in the existing theory. In order to fully meet the IoT-driven transformation an extension to the existing collaborative view(s) is necessary, which encompass the following aspects:

Strategic Issues

- The core is no longer a rigidly guiding feature of what to make-or-buy, it is rather used to identify what the organization has to work with or what they can contribute with in an IoT solution. As IoT challenges the value offering or “core “ of the companies’ solutions, it is important for the firm not to get too focused on what is core and non-core because then they may lose miss opportunities that are occurring in the periphery outside the focus or core of the firm.
- Core can help guide or at least give the organization a hint of where its key competencies lie, however it should not restrict them from making bets on IoT. A collaborative view on boundaries does however help firms keep the boundaries narrow when trying to find a role in IoT, because it allows the firm to couple new resources and competencies through using external partners and the firm’s ecosystem, rather than extending its boundaries through internalization

Trade-offs

- The typical views on “tradeoffs” when sourcing are not considered in the same sense.
- 1) Internalizing to avoid competence erosion is not a relevant consideration within the IoT context, because within IoT there are so many ways to tie together solutions and with the speed of the market, former core competencies may become redundant and many, new competencies are required at a high pace. Instead, new competencies are reached through partnerships based on trust and mutual gains.
- 2) Supplier dependency – IoT requires combination of different areas and speed to market, often the solutions are completely new – it is not a question of whether or not the firm wants to be dependent on a suppliers anymore, dependency on ecosystem is unavoidable within the context of IoT and cannot be viewed with the same skepticism as traditional theoretical views have.
- Brand – It is important for the firm to know what its brand can and should front versus where other players can provide a more competitive part to the prospective or existing IoT solution(s).

Sourcing relationships

- Suppliers/partners are not just to fill in areas that are non-core, each partner contributes with its strengths, and what is legacy-core to the firm may simply be the enabling part of the solution. Whereas the competitive advantage of the solution is rather what it can

result in as far as dynamic ways for actors to combine resources. Agility in the sense that the network can quickly help put together new solutions and act upon consumer demands.

- Sourcing relationships are to be seen as a source of competitive advantage because they can give companies the capabilities to compete with “faster time to market”, “combine cross industry capabilities and competencies”, “remain agile and have an ear to the industry with proactive network and ecosystem management”. IoT implies a need for all the aforementioned characteristics, which partner and ecosystem strategies can allow for without a need for the firm to alter its boundaries.

9. Conclusion

In this final chapter the conclusions of this thesis are outlined. First, the purpose of the thesis is repeated in order to remind the reader of the aim of the study. Then follows a discussion and conclusion regarding the answers to the research question. The chapter ends with a summary of the limitations of the thesis, followed by suggestion for further research on firm boundaries and IoT.

The purpose of this study has been to investigate how a set of large, established, Swedish companies in different industries, view their boundaries today, when set in the context of IoT. IT-driven transformation has had effects on firm boundaries of firms in the past, with the third IT-driven wave of transformation is claimed to have an even greater impact on firm's value propositions and value chains, and as such on firm boundaries. The existing theories on firm boundaries today date back to before the rise of IoT. Due to the predicted impact of IoT on firms, and the scarce research carried out in the area, it is interesting to investigate how well existing theories can explain firm boundaries within the context of IoT, or if new, modified explanations are needed. Thus, the study has aimed at answering the following research question:

- ***How well can traditional theories on firm boundaries explain how firms view their boundaries within the context of IoT-driven transformation?***

Within the context of IoT, existing theories can explain how firms view their boundaries among the majority of firms to a certain extent. However, no theory is helpful in explaining throughout all the factors that have been researched in connection to the view on firm boundaries among the case companies. Also to note, it has been found that the theories TCE and RBV, are only helpful to the extent that divisions are carrying out business as usual within the context of IoT. Among the minority of firms, who are the most involved in IoT, the existing theories couldn't explain in full the view on firm boundaries. Thus it implies that when the divisions start having more IoT related items or activities existing theories might become less helpful. For the case divisions more involved in IoT the only view on boundaries that has to a greater extent been able to explain and support the practice of these divisions, is the collaborative view. The collaborative view has been helpful in explaining the strategic issues and sourcing relationships at large for these firms, which is probably related to it being a more nascent view (especially the ecosystem view from 2012). As such, we conclude that the degree, to which existing theories can explain how firm view their boundaries within the context of IoT, varies depending on involvement in IoT, with the collaborative view(s) being the most helpful in explaining and therefore the most useful for divisions looking to offer IoT related solutions.

Furthermore, our analysis has shown indications toward a new view on firm boundaries. Firms, whom wish to explore their role within IoT, can take inspiration primarily from our two case companies currently doing so: TeliaSonera, through their division Global IoT Solutions and Ericsson, through their division CVC. Complementing to this, Antoma Consulting, who have

been interviewed to shed light on Telia's partner strategy has provided additional understanding to what "partner management networks" imply within the realm of IoT, for instance.

With regards to strategic issues, what is considered 'core' to the main company does not constrain or limit any decisions going forward within these divisions. As these divisions seek to explore new, possible solutions within an area of huge potential (IoT) they are given more freedom compared to other business units within their respective companies. What is rather considered at first among these two case companies is the potential to collaborate, which is why one of them has an established IoT Expert Network (Telia) and the other firm aims to be proactive in their ecosystem (Ericsson CVC). Sourcing relationships and existing ecosystems are considered early in the make-or-buy decision, and Telia's Partner Program, set by Antoma Consulting, specifically aids in the decision-making for Telia, as through the program Telia can enter into varying types of partnerships easily where clear management is set. The proactivity that is showed primarily by Telia, and also from Ericsson CVC, can create benefits such as easier access to information and ability to create new solutions faster.

Clearly, an outside-in approach is necessary when engaging in IoT, leaving typical trade-offs such as competence erosion and supplier dependency irrelevant and not limiting to any engagement in sourcing. New competencies will be needed on a regular basis and not the least for cross industry solutions. The new requirements for broad and continuously new competencies cannot all be internalized through M&A. Rather both large and small actors should be given the opportunity to contribute in new solutions by the firm through collaboration instead. In summary, a new view on firm boundaries can be similar to the collaborative view(s) to a certain degree, yet with modifications with regards to the view of the core and focus on partnering. The core should be considered less guiding and eventually more dynamic than static, where the original idea of sustainable competitive advantage is challenged, while partnering and having an ecosystem view allows the firm to proactively meet IoT-driven demands cross-industry and markets.

In conclusion, by shedding light on how eight, cross-industry case companies view their boundaries today, we argue that our research contribute with an increased understanding for make-or-buy decisions within the context of IoT, through outlining how far existing theories stretch in application and new modifications needed on the traditional view on boundaries. A new view needs to encompass 1) a core that is continuously updated and highly flexible in the way it guides a firm's pursuit of new areas to compete, 2) an emphasis on competing with focus on partnering to gain resources and competencies, 3) a focus on partnership and ecosystem management that allows for the second objective to occur. The extended collaborative view(s) that we call for, puts focus on the management and active interaction of the firm with external parties in order for the firm to be able to efficiently couple new resources and competencies to create solutions proactively in the IoT environment.

9.1 Limitations of research

First, this study proposes indications on a new theoretical outline that needs further support from empirical evidence. Second, as IoT has just begun to show its effects on business practice, and none of our case companies have clearly defined their role in IoT yet, the study is limited to the time being. It is clear that, although IoT as a technological phenomenon has been explored for the past decade, at least, it is still in its nascence. This means that although IoT and its implications are highly relevant for each of the case companies, IoT may not have as equally affected the chosen divisions at the time of research. As the highlighted divisions that differed the most from existing theory were specifically providing IoT related solutions, and the rest of the case company divisions were not currently involved in IoT related projects, this can be one reason for the contrast between the case companies' views on boundaries shown in the results.

Furthermore, the make-or-buy decisions, which is the initial context that the project is set in as asked by Volvo Group Telematics, is related to many divisions of firms and for instance an actor within purchasing and an actor within IoT solutions can have different views and emphasis on targeted areas. As the interview candidates came from a variety of positions, even though they were proactively researched and initially assumed to have similar perspectives or relationships to make-or-buy decisions when chosen, our results may be skewed to each candidates personal view.

Another limitation is that, as many different industries may currently be going through times of change that are not directly correlated to the trends within the IoT, it can be difficult to make the cut between what is an implication of IoT and what is simply due to an industry change brought on by other developments. The research does its best in pinpointing specifically IoT related changes and implications, however this is something that should be considered nonetheless.

9.2 Recommendation for further research

The results of our research project indicate a number of different areas of further research within the context of IoT. Firstly, carrying out a deep dive of boundary decisions within any one of the industries or companies would give way to very interesting and more in depth insights into more specific industry or company cases, which may allow for more specific implications. Furthermore, IoT may extend into new views and even a fourth view on the boundary of the firm. As this research has found that none of the existing views on firm boundaries can fully explain business practice set in the context of IoT, research that aims at creating a fourth view on firm boundaries can be of further interest.

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Appendices

Appendix 1 – Interview guidelines

Background

Please describe your position at the company, what is your role?

Make/buy strategy & decision making process

How do you decide what products/services should be carried out internally versus externally (through for example outsourcing)?

What is your make/buy strategy?

What factors do you consider when making this decision?

Sourcing relationships

How would you describe a supplier?

How would you describe a partner?

What are the key differences?

Are there nuances within supplier and partner categories?

Do you have a verbalized partner/supplier strategy?

What are the main criteria you look for in your suppliers and partners?

How do you ensure that you and your partner meet each other's goals when carrying out a project together?

Risks/trade-offs

What are some risks associated with sourcing?

Are the risks different depending on whether it is a supplier or a partner?

How do you mitigate these risks?