



UNIVERSITY OF GOTHENBURG

Managing digitalization with Dynamic Capabilities

- A case study on how incumbent firms are
building dynamic capabilities to address
digitalization

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Abstract

Digitalization has a strong impact on all industries. The emergence of new technologies, also influences both society and the economy. For product developing firms this infer a need to respond to market change and innovation in product development. Digitalization influence uncertainty and pace of change, and puts pressure on incumbent firms to adept the organization for the rapid changing market to stay competitive. Adjusting against the new market logic, require firms to develop dynamic capabilities to address new technologies and market needs, in order for quick renewal of their capabilities. Incumbents have to find ways to manage uncertainty in the evolution of technologies, path dependency and switching costs, by new ways of viewing their investments in technology. Option theory is a valuation tool for strategy and investments, used to balance investments in technology and uncertainty. The study has for that reason applied option theory as a theoretical lens to display the firm's resources and capabilities and employ uncertainty as part of the approach. The purpose for this thesis has therefore been to increase the body of knowledge on how product developing firms are creating new capabilities, to manage new market logic, technology and rapid changing markets.

This thesis has used qualitative content analysis and secondary data from four global Swedish product developing firms with a prominent market position to study how incumbents respond to digitalization by building new capabilities. The case firms Assa Abloy, SKF, IKEA and Electrolux and their capability development in response to digital technology were analyzed. The main result from this thesis are that product developing firms are building dynamic capabilities to integrate knowledge of customer and market close to the production process for digital products and technologies. To meet expectations from the market considering new ways to experience and consume products, capabilities to manage innovation effectively are being created. Digital technology requires firms to build capabilities to acquire and share knowledge on technology and markets to leverage the logic in the digital economy.

Key words: IT management, dynamic capabilities, options, digitalization, resources, digital innovation.

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1. Introduction

This chapter is an opening to present main challenges on the digital market, namely, uncertainty and pace of change. Further, we introduce a background for subsequent chapter, followed by the research question and the thesis disposition.

The progress of digital technologies permeates industries at a much quicker pace. Components of digital technologies i.e. hardware, software and networks is not new, however it is argued that they now have been refined to a level where the building blocks of digital technologies can become both important and transformational to society as well as the economy (Brynjolfsson & McAfee, 2014). In scale economies, competitive advantage in high technology industries has often been a case of cumulating different technology asset of value, however in the digital economy, firms need to quickly respond to changing markets and have a flexible product innovation (Teece & Pisano, 1994). Organizational literature that previously recognized technology as immutable and a fixed asset may need to rethink, that if the technology underlying organizational functioning is dynamically changed, corresponding changes in organizational functioning is required (Yoo et al 2012). Industrial production also deals with the complexity of handling formal and informal relationship that overlap, interact and are changing at a much quicker pace. Therefore, organizations need to find a way to adapt to change and evolution (Bryson et al, 2004).

Digital technology is inherent in society today and is influencing how humans and organizations interact with computers and technology (Yoo, 2010). Digitalization influence two factors, the first being uncertainty. The ever-increasing uncertainty surrounding organizations require a different way of obtaining business value. One way is to exploit the developments in the area of information technology (Kulatilaka & Venkatraman, 2001). Organizations are more dependent on digital technology since it is an integral part of their products and services (Yoo et al., 2012), thus making it difficult to separate the infrastructure for technology from business processes (Bharadwaj et al, 2010). The second factor influenced by digitalization is pace of change. Digital technology and globalization function as a powerful driving force and changes the way organizations need to be managed (Prastacos et al., 2002; Lahiri et al, 2008). Adaptation to change therefore relies on digital technologies as an enabler (Sambamurthy et al, 2003; Barret et al, 2010).

Digitalization creates a more diverse marketplace, there is no longer an issue of major breakthrough in separate technologies, but to create possibilities to combine and digitize complementary technologies (Yoffie, 1996; Liu, 2013). This capability makes it possible to generate new functionality and extend the characteristics of products into new markets. However, digital convergence as the latter refers to is follows a great deal of uncertainty over timeframes, since the progression rate for separate digital technologies differs (Yoffie, 1996). Also as a result of digitalization, the traditional boundaries for industries are being blurred (Yoffie, 1996; Yoo, 2010; Lin, 2013). The uncertainties many organizations are facing today in the dynamic marketplace enquire new ways of managing and organizing different digital solutions, to be competitive in the market. The need for quick renewal of organizational

capabilities, is particularly important, in areas where technology discontinuity exists (Ellonen et al, 2011). The essence of strategic management is to achieve and sustain competitive advantage, consequently, strategic management influences capability development. Research addresses the issue of managing uncertainty in the marketplace with the concept dynamic capabilities (Teece et al., 1997). The need for dynamic capabilities are increased, research indicates that competitive advantage reduces remarkably over time in hypercompetitive or high- velocity environments (Barreto, 2010). Dynamic capabilities consist of specific strategic and organizational processes that generate value for organizations in dynamic markets (Eisenhardt & Martin, 2000). This is possible through manipulation of resources with the intent to create new value-adding strategies. However, effective patterns of dynamic capacity will change in relationship with dynamic markets (Eisenhardt & Martin, 2000).

The need for adaptation in response to digitalization and uncertainty in the marketplace is an area of interest that calls for more research (Ferrier et, 2007; Yoo et al, 2009; Nambisan et al, 2013). The concept of, and different types of dynamic capabilities has mainly been theoretical in the literature (e.g. Verona & Ravasi, 2003), research is however scarce in putting this concept into real practices that shape dynamic capabilities (Ellonen et al, 2011). In addition, dynamic capabilities are not an off-the-shelf capability (Helfat et al 2007; Helfat and Peteraf, 2003), studies on how firms develop dynamic capabilities is therefore crucial in understanding the concept (Kahl 2014). The purpose of this study will subsequently be, to increase the body of knowledge on how product-developing firm engage in building dynamic capabilities to address digitalization. Specifically, we have studied four different incumbent firms, where each firm represents a different industry. The research question for this study is: *How are product-developing firms creating dynamic capabilities to address digitalization?*

To focus our attention on uncertainty, market opportunities and change management and answer the research question, option theory will be used as a theoretical lens. To manage uncertainty and pace of change coupled with digitalization, firms use option theory as a tool. Uncertainty is imposed by the unpredictable evolution of technologies and path dependency as well as irreversibility by adaptation -and switching cost. This emphasizes the need for different ways to view investments in technology (Fichman, 2004). Option theory, is utilized to manage both uncertainty and irreversibility with technology investments in rapid-changing markets (Sambamurthy et al, 2003), by making small preliminary IT investments, which generate growth options (Fichman 2004). Using option theory as a theoretical lens display firms resources such as assets and capabilities (Bowman & Hurry 1993), hence making the approach a preferential choice for this thesis. The intended audience for this thesis is part academia, stemming from that dynamic capabilities and digitalization are subject to intense discussion and research within academia. Further, the result of the thesis also turns to professionals in product-developing firms that are undergoing digital transformation, with the intent to highlight the complexity in this effort.

1.1 Disposition

1. Introduction: The aim of this chapter is to discuss the challenges on the subject for this master's thesis and clarify related question in our thesis based on the literature, that permits for the reader to be given a background and elucidate on the purpose of thesis.

2. Related work: This chapter outline relevant literature and theories in relation to the research question for the thesis. The related work starts by introducing the basic definitions of digitalization and dynamic capabilities, in two different sections. In respective section, previous research is considered and elaborated on. The purpose of these sections is to give insight on different dimensions of digitalization and dynamic capabilities as well as relationship and effect on product developing firms.

3. Real options: The third chapter presents the theoretical framework, which the authors have utilized to analyse the empirical data in chapter five. The concept of real options as a valuation technique to manage IT investments is elucidated on. Further, the chapter give the reader an understanding of the option cycle, which serve to clarify the different options and value, when firm invest in technology.

4. Method: This chapter contains an overview of the chosen research approach. Firstly, it introduces the definition of the qualitative content analysis which has been used in the research process. Secondly, it explains data collection, choice of firms, research setting, data analysis and software tools that have been used for gathering of data. Finally, it explains reliability and validity throughout a qualitative research.

5. Empirical finding: In empirical findings four market leading firms are introduced. We focus on how these firms perform in their associated industries based on the research's theoretical lens. Specifically, how firms invest in digital technologies based on the market trends and specific features for each industry.

6. Discussion: In this chapter, we use our related work to discuss our main empirical findings. Further, each case study is structured and analyzed separately in three step based on option cycle to outline how firms create dynamic capabilities to address digitalization.

7. Conclusion: This chapter aims to conclude our main research findings. we outline how firms cope with market uncertainty through digitalization, and how dynamic capabilities aid firms to respond rapidly to the market demand. Finally, we elaborate on the main features that all associated firm have in common. More specially, how these firms collaborate through digital technology with all partners in the whole value chain to create necessary capabilities for constant product development, and to stay dominant in their associated industries.

8. Limitation: In this chapter, we outline all the theoretical aspects that are not excluded from our research.

2. Related work

In this chapter we outline previous research on digitalization and dynamic capabilities, as the thesis theoretical framework.

2.1 Digitalization

The business environment for product developing firms is transforming, as they operate in a world that is increasingly influenced by digital technology (Yoo et al., 2012). This puts pressure on firms to develop capabilities to become more agile and capture market opportunities with speed (Sambamurthy et al, 2003). In a business environment with challenges and uncertainty, it is argued that maintaining focus is important, however, incumbent firms face the challenge of cost-control, whilst at the same time keeping options open for growth at a later date (Chesbrough & Garman, 2012). The challenge is not only the transition into utilizing digital technology for competitive reason, but also to find a working combination with existing development practices (Svahn, 2014). In the Global Annual CEO Survey (PwC, 2015), leveraging digital technology to create competitive advantage is a top priority among global CEO's. Digital technology is now a core component in products, services and the daily operations for many incumbent firms. Digital convergence, i.e. integrating digital technology and non-digital artefacts, brings forward a shift in the very nature of products and service innovations (Yoo et al., 2012), which promotes radical innovations (Yoo et al, 2009). Innovation can be defined as a redefinition of existing practices or creating new practices (Alberts & Hayes, 2003).

Digital innovation on the other hand is argued to centre around, digital technologies capabilities to inspire to matching and mixing with both physical and digital products (Svahn, 2014). Digital innovation is often the source of transformative growth, however the development of new technology needs managing, and a suitable and a powerful business model to become truly successful (Johnson et al, 2008). With the supply side driven logic from the industrial era not being a viable option anymore (Teece, 2010), and the emergence of new communications and computing technology, which infers more choice and nuanced needs for consumers, it can be argued that, incumbent firms need to develop a customer-centric perspective and new value propositions from products and services (Teece 2010), in order to create competitive advantage.

Changes in technology often works as a driving force in providing new ways of fulfilling customer needs (Teece, 2010), i.e. a market opportunity. The value of innovation from a competitive point of view, depends on the value added and how it is applicable to the organizations existing competence (Abernathy & Clark, 1985), hence innovation is not only a matter of R&D, but also in developing complementary assets and infrastructure (Teece, 1986). Henderson and Clark (1990) argue that the underlying product, reflects firm -and knowledge flow in high technology firms. By altering the product architecture, for example by placing components in an integrated system, necessitates similar changes in firm structure, as the current product architecture is inherent in the organizational structure (Henderson & Clark 1990; Yoo et al, 2012). Changing the architecture is equal time consuming and

difficult, as a consequence, incumbent firms struggle to adapt to changes (Henderson & Clark, 1990).

In the literature, technical innovation within product development has traditionally been divided into either incremental or radical. Incremental innovation entails to the process, of introducing small changes to the product, by making use of the established design. Incumbent firms can often benefit from incremental innovation, as it reinforces their existing capabilities. It requires a substantial skill set and ingenuity but can be financially rewarding. Radical innovation, infers a new set of engineering and principles that open up for new possibilities and markets. Hence, different types of innovation require, different organizational capabilities. However, radical innovation can pose a problem for incumbent firms, because it destroys the usefulness of their current capabilities. They become restricted by their existing structure and dependent on the emergence of new technical and commercial skills. This opens the marketplace for new entrants, not suffering from previous legacy. Thus, new entrants are less restricted during transformation of an industry (Henderson & Clark, 1990).

Henderson and Clark (1990) argue that the concept of incremental and radical innovation is too narrow and adds architectural innovation, the essence in architectural innovation is to link existing components (leaving the core design untouched) in new ways by reconfiguring the established system. This entails to utilizing existing knowledge in current components, and create new linkage between them. Creating value from architectural innovation requires component knowledge, i.e. knowledge in core design concept and how they are implemented in specific components. It also requires architectural knowledge, i.e. how components create an integrated and coherent whole. Classification of knowledge on components and architecture is useful, to leverage the impact of a particular innovation and the existing knowledge.

The possibility to enrich physical products with digital properties (Yoo et al, 2012), enables for digitized products to connect to global information infrastructures through various communication technology and form loosely coupled networks (Yoo, 2010). Being connected to a network, opens up an array of possibilities and ways to consume products (Yoo, 2010). Therefore, the use of digital systems is key in the digital economy for both internal and external business operations and incorporates several activities in the value –and supply chain (Ferrier et al, 2007).

The digital economy is pushing incumbent firms into convergence and towards expansion of their strategic options in order to stay competitive (Slywotzky & Morrison, 2000). In other words, a firm's capabilities will have an important effect on the value they create in the digital economy. As such, digital technologies facilitate for product developing firms in creating new value propositions and ways of making profit (Slywotzky & Morrison, 2000). This highlights that it is a new value, not improving what is already in place. Therefore, products need to be smarter and more versatile, a means to transform the way products are being experienced and consumed (Yoo et al, 2009). At the same time, digitization of internal

business process gives preferential access to real-time data, better understanding of market opportunities as well as appropriate responses to them (Ferrier et al, 2007). Competitive advantage in the digital economy and managing digital convergence does not necessarily mandate, the use of novel technology as much as viable strategies on how to capitalize in this new era. Consequently, digital strategies are essential, since digital convergence, challenges the basic premise of product developing for incumbent firms. The emergence of new business processes is also necessary, to mediate the turbulence and uncertainty associated with modern technology (Yoffie, 1996).

In the post-dotcom decade many firms are taking advantage of lower priced computing, both hardware and software and connectivity, as a mean of adapting their business infrastructure to the digital economy (Bharadwaj et al, 2013). However, to address business problems in the digital economy, organizations must create the capability to combine and exploit disparate technology and create alignment with organizational and environment resources (Mata et al, 1995). The undertaking of digital convergence in incumbent firms increases the possibility of enhancing agility, investments aid firms leveraging digital technologies, in support of their business strategy. The disruptive nature of digital technology, is unbundling both physical value chains and information and sets apart organizational infrastructures for manufacturing and procurement. This increases the need for IT in enabling competitive advantage (Sambamurthy et al, 2003) The rapid development of digitalization and it's challenges for incumbents' firms therefore needs proper attention in order for firms to extract business value in the digital economy.

Internet of things (IoT) has surfaced as a way product developing firms can leverage digitalization in the new economy. Gartner predicts that IoT in 2016 will support services spending up to \$235 billion and everyday 5.5 million new things will be connect to the infrastructure (Gartner.com, 2015). These technologies are disrupting industries, drawing from the fact that they allow for novel ways of doing things, inferring a different set of capabilities is needed to be able to capitalize on digital investments. Consequently, innovation in technology and the marketplace is important in gaining competitive advantage and productivity growth, however different types of innovation influence, various competitive business environments differently. Hence, the set of managerial and organizational skills needed differs, depending on environment and innovation. The foundation of competitive advantage lies on material resources, applicable knowledge and human skills and relationships. Together, these competences create product feature that are attractive to the market, making the capability to manipulate existing resources, skills and knowledge important (Abernathy & Clark, 1985).

In product developing firms' digital innovation is now (slowly) becoming a reality. By shifting focus from products to platforms, products can be subjected to innovation in networks and ecosystems, inspiring to new functionality and increased variance in their product offering as well as income streams (Svahn, 2014). As mentioned, in some industries and incumbent firms, technology platforms start to emerge. A platform can be defined as a base of related components used by firms to build related digital product-series (Cusumano,

2010). From an economic perspective Eisenmann (2006) make the distinction that platforms are, products and services attracting various groups of users in two-sided networks. The main advantage with technology platforms for products can be therefore be argued to be the potential to create multi-sided business, by bringing together different customers or users in need of each other (Evans et al 2006). A single firm seldom has the capability to create a platform with great variance of applications and services, thus the creation of network effects is necessary (Cusumano, 2010). Platforms then become a facilitator of transactions between consumers that not previously had the possibility to connect each other (Gawer, 2014). Incumbent's early advantages become powerful when triggered by network effects, as adoption feed more adoption and growth (Gawer 2014).

2.2 Dynamic capabilities

Few organizations have the capability to invent new markets or quickly penetrate emerging markets (Prahalad & Hamel, 1990). One reason is that it is easier to continue on the same path than to do something different. However, in global markets with increased competition and emerging technology, transformation becomes necessary (Helfat et al, 2007). Therefore, the difficult task for management is to build an organization that can develop products with irresistible functionality, or products that have not been perceived yet (Prahalad & Hamel, 1990). To address uncertainty in the marketplace and encompass organizational growth and competitiveness, incumbent firms need to develop dynamic capabilities (Vassolo & Anand, 2008). In this sense a capability, is the capacity to execute a specific task (Helfat et al, 2007). Dynamic capabilities can be defined as an organization's ability to integrate, create and reconfigure both internal and external competences to address changing environments (Teece et al.1997; Barreto 2010; Tsai et al, 2012). The concept of dynamic capabilities comes with great variance, some enable firms to start new businesses through alliances and acquisitions, others aid in the creation of new products (Helfat et al 2007). Hence, the usefulness of a particular dynamic capability depends on the particular context.

Subsequently, dynamic capabilities are a measure on the organizations capability, to evolve their assets and create new operational capabilities (Ellonen et al, 2011). A common problem organizations are facing is, to update their organizations capabilities as knowledge and skills in managing changing environments. Impediments exist in the form of tough routines, limitations of rationality, unsure imitability, local search limitations and ambiguity (Vassolo & Anand, 2008). To better understand how organizations identify and act upon change, there is a need to scrutinize the managerial and organizational processes underlying dynamic capabilities (Helfat et al 2007).

According to Chien and Tsai (2012), development of dynamic capabilities, knowledge resources and learning mechanisms increase the performance of the organization. Customer-related and competitor-related knowledge are resources that have a positive effect on dynamic capabilities. This is possible through understanding customers and competitors in line with adapting their capabilities to a changing environment, making integration of knowledge resources a necessary component. A dynamic capacity as such, affects the

transformation of the capacity of resources. Learning mechanisms as a complementary component, for the development of dynamic capabilities, can act as a mediator of the effects of knowledge resources on the dynamic capabilities (Chien & Tsai, 2012). The traditional way of achieving business success, i.e. ownership of tangible assets, maintaining alignment and quality, cost controlling and optimization of inventories, though still important, is simply not enough to sustain competitive advantage in markets influenced by digital technology. Many organizations are turning their heads toward innovation as a mean to create competitiveness, however innovations must be combined with matching organizational and management innovations in order to succeed (Teece, 2007). Also strategy analysis and a viable business model are necessary, in order to show how value is created and delivered to the customer and turns investments to profit (Teece, 2010).

Ordinary and dynamic capabilities

The typical type of enterprise capability, ordinary capabilities includes managing the administrative, operational, and governance-related functions that are considered necessary to implement the tasks. The second type of capability, dynamic capabilities is described as a higher level of activities that enable firms to control their ordinary activities to a high peak. The latter capabilities prepared by management of company resources cope with the fast-changing business environments. That is to say, the dynamic capabilities become more important in business environments that are affected by strong innovation-driven competition (Teece, 2014).

Di Stefano, Peteraf and Verona (2014) note that there are two different views on dynamic capabilities. The first one is rooted in behavioural theory, which is in line with organizational theory. In other words, firms are striving to adapt to the changes that are an important part of organizational theory, which leads firms to achieve broader organizational goals such as growth, learning and organizational change. The second view stems from the resource-based view, which is close to economic logic. The latter view has its roots in the competitive strategy of focusing on the competitive dynamics and its impact on the company performance. The two types of dynamic capabilities act as a dynamic system, so that they can work simultaneously and in a coordinated and complementary manner (Di Stefano, Peteraf and Verona, 2014). What can be resulted by the above statements is that the difference between the different definitions of dynamic capabilities is not only the difference in interests and perspectives, but it is more about some underlying incompatibilities. Putting differently, dynamic capabilities are divergent in the understanding of the structure developed (Di Stefano, Peteraf and Verona, 2014).

The following describes a structure of the dynamic capabilities that may be developed in two types, both completing each other. Schilke (2014) describes that dynamic capabilities are generally regarded as a strategic management approach that complements the resource-based view. *"The resource-based view of the firm needs dynamic capabilities to explain how assets get deployed and how rent streams get extended and renewed"* (Schilke, 2014 p.377). Since organizations are operating in changing environments, their dynamic capabilities need

to change accordingly. This can be achieved, using a strategy developed which emphasizes second-order dynamic capabilities. That is to say, to innovate and develop first-order dynamic capabilities with the help of second-order dynamic capabilities "learning-to-learn" routines (Schilke 2014). This statement suggests that organizations re-configure their first-order dynamic capabilities. Second-order dynamic capabilities show how dynamic capabilities associated with first-order dynamic capabilities transform organizational resource bases, and thereby expand our understanding of strategic change. Second-order dynamic capabilities affect performance in most cases, by its effect on first-order dynamic capabilities, see figure 1 (Ibid.).

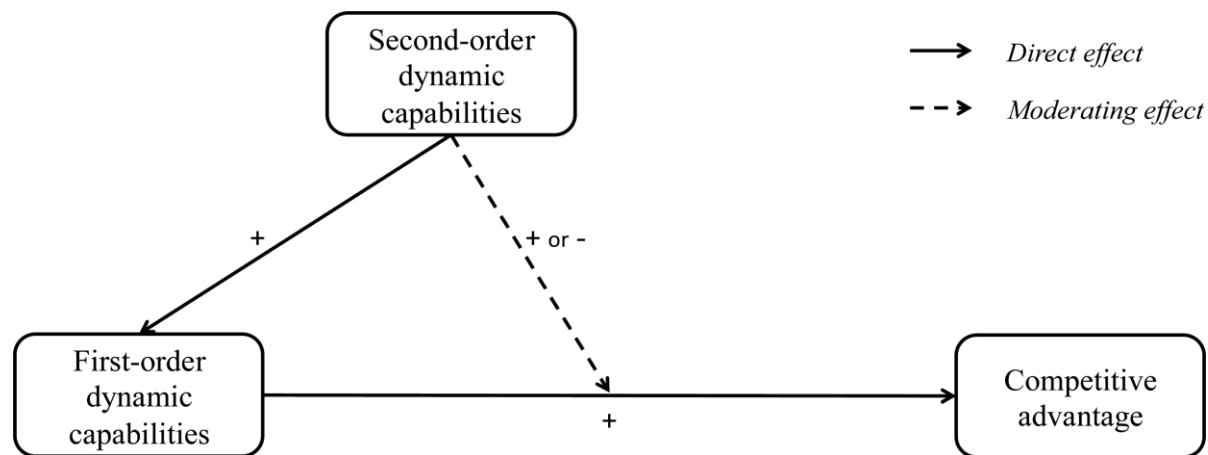


Figure 1: relation between second-order dynamic capabilities and first-order dynamic capabilities (Schilke, 2014, page.371)

A perspective of dynamic capabilities is the idea that the applications of such capabilities is based on organizational procedures-learned and it gets repetitive behaviour patterns that depend on business processes. However, if the dynamic capabilities are recreated by changes in organizational routines, then the company can make use of second- order dynamic capabilities. First-order dynamic capabilities are routines that transform organizational resource bases. Second-order dynamic capabilities are, routines that transform the first-order dynamic capabilities (Schilke, 2014). Strategic alliances can be considered as an opportunity for firms to gain access to resources beyond their borders (Schilke, 2014). Alliances act as a tool for expanding the organization's resource base. Alliance management capability is an example of first-order dynamic capabilities.

Adaptation to changing markets

An important aspect to take into consideration when it comes to adapting the company to change is how much leadership is committed to take responsibility for detecting and propelling the company towards new markets (Teece, 2014; Picone, Dagnino and Mina, 2014).

"I have endeavoured to make clear that, in my view, dynamic capabilities involve a combination of organizational routines and Entrepreneurial Leadership / Management" (Teece, 2014, s.338).

This means that wise and creative leaders as an organization's ability could create dynamic capabilities, for example, by their actions, such as creating new market opportunities. These actions could lead businesses to the identification, creation and management of change and also the improvement in business performance. Consequently, leaders who do not have the ability to handle uncertainty in fast changing markets fail to recognize important developments, or trends in global markets (Teece, 2014).

In fast-changing environments, there is the manager and the management team who should manage these environments through listening to different opinions and actions which come from staff or other contractors in order not to miss the potential opportunities. Another concern for firms can arise in fast changing environments where dynamic capabilities are broken down because the managers dictate its senior activities. Subsequently, the manager, or the managing team's influence in the decision-making can change, enhance, or vandalize the dynamic capabilities of the company (Teece, 2014; Picone, Dagnino and Mina, 2014).

According to Picone, Dagnino and Mina (2014), it is important for managers to understand that the past success is not everlasting. Therefore, managers must abandon their old mental maps. This plays a great role in the company's success (Picone, Dagnino and Mina, 2014). It is vital that the CEO analyzes the strategic performance and notifies the employees by establishing regular performance reviews and assessments. If not possible, managers should allow consultants to verify the validity of the company's organizational strategy (Picone, Dagnino and Mina, 2014). Otherwise, a project could lead to failure, which means loss of investment and credibility, increased costs and greater confusions (Drummond, 2014).

Responding to market change

Teece (2014) asserts that good strategy -- access to VRIN¹ resources, access to strong ordinary capabilities, scale (of some kind, in certain circumstances), and strong dynamic capabilities could help firms achieve long-term enterprise growth and survival. Therefore, firms with weak dynamic capabilities will be more troubled in fast changing environments, and consequently such firms will have a relatively shorter lifespan. Dynamic capabilities are designed to make it easier to build, and renew resources and assets - both internally and externally, in order to deal with changes in the global market. Management process of change begins with speculation and estimation about the evolution of consumer preferences, business issues, and technology matters. In the next step, these assumptions are validated and fine-tuned so that the company later on would prepare for the execution of constant innovation

¹ The VRIN (valuable, rare, inimitable and non-substitutable) resources underlying for a sustainable competitive advantage (Helfat, et al., 2009).

and change accordingly. Furthermore, strong dynamic capabilities challenge competitors in the industry to prioritize thriving innovation rather than efficiency (Teece, 2014). Thus, the dynamic capabilities not only affect organizational activities and results, but also the development and production of special and unique products and services in new, and existing markets and the crests and through the business environments. In addition, it is an important aspect in the creation of factors such as powerful dynamic capabilities, values, culture, and collective ability. By adhering to these factors, new business models or adapting to rapid change in the business environment can occur relatively quickly (Teece, 2014).

One way to deal with fast changing environments is to examine the organizational structure in connection with organizational changes. Kleinbaum and Stuart (2014) describes "intraorganizational social networks" as a critical success factor in individual careers. In other words, each individual in the organization can affect the level of its performance. The social network, which is inside the company affects the company through a) creating coordination b) extending adaptability. According to Kleinbaum and Stuart (2014) the company's performance is determined based on the degree of network responsiveness. This means that firms in which the network reacts slowly to changes becomes more adept at creating first coordination through dividends of the company, through which the informal structure facilitates dynamic ability. At the same time, firms with fast network responsiveness, apply the changes more easily and quickly in the organization. All in all, this could result in the speed of the network responsiveness affecting the dynamic capabilities and hence business performance (Ibid.).

Therefore, firms need internal capabilities to identify, develop and standardize capability at the organizational level in line with capacity development structure within the company's network and the location of people within it (Drummond, 2014). However, some organizations choose to reduce human error, and inability by using sophisticated planning and tools. This strategy can sometimes cause problems for organizations, by becoming exaggeratedly focused on an organization's capabilities and ambitions. This distracts the organizations of the competition in similar projects in other firms in the same area. In other words, fluctuations in the market can be based on the competitors and the blindness towards competitors can cause losing the lot (Drummond, 2014). Usually, in such firms, managers ignore negative experiences, and try to give attention to the positive experiences. In such cases, managers often believe that the expectations are close to their success, but the results show something different in reality (Ibid.).

One factor that is believed to slow down the responsiveness to changing markets is supplying knowledge and learning from outside of the firm, i.e. external organizations (Kahl, 2014). However, Kahl (2014) claims the learning is involved in the development of capability, and especially occurs in a so-called trade organization (external organization). Industry associations code capabilities, skills and knowledge as part of professionalization. In other words, firms rely on external sources for learning rather than relying on the internal resources. This may partially be due to the company itself lacking the resources (people) with relevant competence to formulate and codify experience (Kahl, 2014).

If the company had the resources (learning) intrinsic, the construction of dynamic capabilities would be significantly easier, especially when it comes to introducing new technologies in the organization that are difficult to manage. In such scenario the company that lacks the learning in developing the ability internally, may be held back from the latest technology and therefore would have to wait until the resources (required for the new technology) are developed externally, and then implemented at a later date. The knowledge brought into the company with the help of professionals - who are there to deliver the basic concepts and methods, can improve the quality of codification by providing dedicated resources. Professionals work on the path to educate and teach their colleagues, and spread the knowledge to the rest of the company. This process is called "normative isomorphism" (Kahl, 2014).

Globalization and pace of change

Dynamic capabilities are of particular importance, to the performance of multinational enterprises operating on markets with specific characteristics, e.g. business sectors of global economy and high-technology industries. In these marketplaces, open to international commerce with rapid technological change, technical inventions must be combined into product/services in order to satisfy customer needs. Finally, the business environment is flawed, in the exchange of managerial -and technological knowledge. Competitive advantage in these markets is less dependent on optimizing or scale of economies (Teece, 2007).

The rapid development of the global economy is forcing organizations to acquire a capability where the company is agile and flexible at all levels for both survival and growth. To do this, management should formulate and pursue strategies to promote and enable flexibility, learning and innovation. In other words, rapid changes impose the requirement for firms to continuously create and recreate capabilities and evaluations, and test the results of the new features. In this way, management can gain an understanding of how new features contribute to the development of techniques, and market opportunities related to customer demands. Market opportunities were given greater attention when the forces of globalization created competition and exposed more potential markets. Therefore, the firms had to come up with new business models and the dynamic capabilities to manage rapid changes (Teece, 2014).

As mentioned in introduction, management of uncertainty is a central ability in creating dynamic capabilities. We have used option theory since it gives the tools to explore how dynamic capabilities are created when firms try to deal with uncertainty, discover market opportunities and manage change. Finally, firms use option theory as a tool to manage the ambiguity coupled with the digital technology and to manage IS investments in an uncertain fast-changing market (Sambamurthy et al, 2003).

3. Real options

In this chapter we introduce option theory as a theoretical lens for our research. Specifically, the chapter describes the option cycle that will be applied to the empirical findings.

3.1 An introduction

This introducing text serves as to give insight to real options and the option cycle. The option cycle can be referred to as the framework underlying real options and explicates the option path during decision-making for investments. Hence, it is of importance to this study to understand the relationship between the components of real options. The locus of attention for real options is decision-making under uncertainty (Dixit & Pindyck 1994), as well as strategizing (Amram & Kulatilaka 1999). Real options has become a tool for management when leveraging investments in technology within the area of IS (Sambamurthy et al 2003). There is an increased interest in the field of strategic management, on how to make better strategic decisions, when dealing with uncertainty (Reuer & Tong, 2007). In addition, the pace of change in the area of information technology (IT) has accelerated the last decade (Fichman, 2004).

The question remains how organizations can respond to increased uncertainty, for gaining potential opportunities in high tech markets. However, uncertainty also creates opportunities, i.e. proactively managing the investments through changing plans, to manage ambiguity. The most common financial tool for the valuation of strategy and investments is discounted cash flow (DCF) and net profit value (NPV). However, usage of DCF and NPV require that firms follow an inherent predetermined path, regardless how events play out (Luehrman, 1998). Decision-making with valuation tools like DCF and NPV, therefore becomes colored by some degree of optimism (Amram & Kulatilaka, 1999).

As digitalization influence uncertainty, firms need to find valuation techniques that incorporate uncertainty inherent in business and decision making in their investment decisions (Luehrman 1998). Linkage between uncertainty and opportunities can be described through a set of options. This infers, that investments create valuable opportunities, which can generate additional value to existing investments. In that sense, an investment opportunity becomes a set of available options for managers (Amram & Kulatilaka, 1999 s.6). These options can then be managed, in a sequential manner through option thinking (Reuer & Tong, 2007). In option theory, option is a contract that gives the possibility, but does not mandate an obligation to either invest in or sell a particular asset at a future date (Mackenzie, 2006). Option thinking aids digital investments and management of uncertainty by incorporating resource allocation, sense making, strategic positioning and organizational learning, in one framework (Bowman & Hurry 1993).

By using the option lens perspective, firms can get insight into the organizations resources as well as capabilities and assets by providing a collection of options for future strategic choice. When firms existing resources allows access to future opportunity, digital options come into existence (Bowman & Hurry 1993). Option theory originates from the world of finance and is used to manage investments under uncertainty (Dixit & Pindyck, 1994). Real options extend

financial option theory, and incorporate options on real (nonfinancial) assets, hence real options. The comparison between real options and financial options is elucidated below.

*“By definition, a financial option gives **its holder** the right, but not the obligation, to buy or sell the underlying asset at a specified price ... on or before a given date... (Reuer & Tong, 2007 s. 5). On the other hand, “ real options are investments in real assets, as opposed to financial assets, which confer **the firm** the right, but not the obligation, to undertake certain actions in the future” (Reuer & Tong, 2007 s. 5).*

3.2 Option Cycle

Real options could be beneficiary in R&D intensive industries as well as industries with projects containing several sequential decisions (Amram & Kulatilaka, 1999). Considering the organizations strategy, there are five types of real options approaches - the option to defer, grow, switch, abandon or learn. These approaches are valuable for decision-making considering market entry modes, market entry timing and a choice of a multinational network (Reuer & Tong, 2007, s.71). Several of these common options are regularly involved in an investment, and the total value of all utilized options together varies from the total of value for each option separately (Reuer & Tong, 2007, s.5).

The first step in the option cycle (see figure 2) entails to recognition of options. A firm consist of a number of strategic choices combined with a set of resources (Bowman & Hurry 1993) Digital options must therefore first be identified and a new way of thinking must be established, i.e. to infuse the discipline of financial markets to strategic investment (Amram & Kulatilaka, 1999). The first step is a matter of sense making, i.e. management must make an inventory of their existing resources and organizational actions (Bowman & Hurry 1993). Investment opportunities are usually extracted from technical knowledge, managerial resources, current market position and the possibility of investments to be scalable. Scalability is an important aspect, differing organizations from each other, the possibility of exercising scalable options can be of substantial value and increase strategic growth (Dixit & Pindyck, 1994).

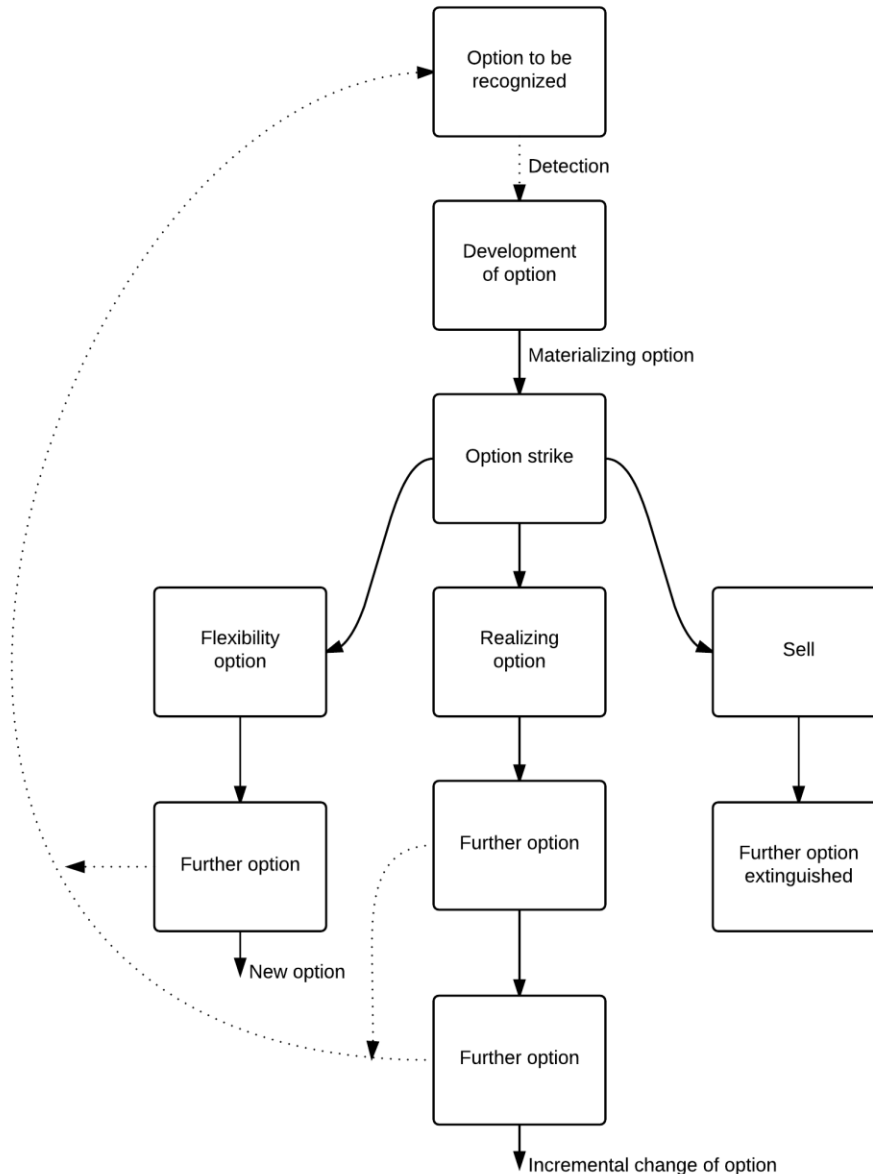


Figure 2: Option cycle, adapted from Bowman and Hurry (1993)

When an option has been recognized, management should secure access to the option by investment in resources and necessary skills, i.e. the development of option. However, the option may be put on hold, awaiting the right opportunity. By investing in a option it becomes a real option. Keeping options "open" (i.e. deferral), given future ambiguity can be of value. When and if the opportunity materializes, the firm is ready to exploit it given their initial investments (i.e. resources and skills) in the option (Bowman & Hurry 1993). Major investments are often preceded by minor investment and corresponding learning, e.g. penetrating a new market is often initiated by initial investments, e.g. a joint venture. The trial investment holds the option open, for a major investment, e.g. a takeover. This permits to learning taking place, which could be beneficiary to further investments (Bowman & Hurry, 1993). Three characteristics are intrinsic, when dealing with investment decisions under uncertainty. First, investment is completely or partially irreversible i.e. the initial cost cannot be retrieved. Second, uncertainty surrounds the potential reward retrieved from an

investment and finally, the third characteristic deals with the timing of the investment, i.e. postponing or go ahead with the investment (Dixit & Pindyck, 1994).

The real options approach function as a source of strategic growth. The ability for an investment to grow and expand is intrinsic in many IT-investments, in particular IT investments aimed to create capabilities for future investment opportunities, open for competitors as well. Investing in these capabilities opens up for other options, and thereby the possibility for the organization to increase their strategic choice in the future (Benaroch, 2002), i.e. strategizing. The source of growth options arises from the interaction between the existing investments, knowledge and capacity and opportunities in the environment (Bowman & Hurry, 1993; Benaroch, 2002). Initiation takes place in response to changes in the market, e.g. threat from competitors. Exercising a growth option and corresponding organizational capabilities, expands and opens up for further options to be exercised (Benaroch, 2002).

Irreversibility and possibility of a delay are important aspects underpinning real option theory. The feasibility of delaying an investment, can affect the choice of investing, should circumstances surrounding the investment change. The decision to go ahead with an investment infers the possibility, of acquiring new information of importance is lost. Delaying an investment has the clear advantage that information of importance can unravel, making the investment less profitable or feasible. The cost of keeping an option open is defined as option value, if the investment is not deemed beneficiary, the organization loses the option value. Option value therefore, needs to be incorporated in the valuation of the total cost of the investment. The value of the investment must subsequently exceed the cost for installation and purchase, by an amount equal to the value of keeping the option open for a future decision (Dixit & Pindyck, 1994). Further, options can be differentiated by dividing them into to call - and put options, where call are options to buy and put are options to sell (Bowman & Hurry, 1993). The action of competitors or lack in preparations can be exposed, thus increasing the need for adaptation.

Exercising on an option, leads to the formation of resources, which in turn opens up for further exercising. Strategies can unfold, when options are struck in a sequential manner along the option cycle. Options can be divided into either incremental or flexibility. Strategy, progresses by striking successful call options, and are reversed by abandoning a call or exercising a put call. A change of strategy takes place, by exercising a flexibility option, i.e. switch to another investment (Bowman & Hurry, 1993). The house building industry can be used as an example, continued investments into the production of house as we know them today is a continuation of the current product strategy. On the other hand, with the advent of internet of things (IoT), adding investments into technology and production of house adapted for connectivity and (IoT), allows for the organization to change product strategy over time. Digital options, then underlies strategy (Bowman & Hurry, 1993), and permits for strategizing.

4. Method

This chapter contains an overview of the chosen research approach. Firstly, it introduces the definition of the qualitative content analysis which has been used in the research process. Secondly, it explains data collection, choice of companies, research setting, data analysis and software tools that have been used for gathering of data. Finally, it explains reliability and validity throughout our qualitative research.

The purpose of this study is to increase the body of knowledge on how dynamic capabilities are created to address digitalization in product-developing organizations. This extends to knowledge on how organizations can be managed in a dynamic fashion. In order to be competitive, organizations need to address uncertainty and increase their level of business agility. This knowledge will be substantial considering that digitalization is changing at a rapid pace, thereby having a strong influence on products and services being offered to the marketplace. Possessing the capability for adaptation of organizational capabilities in step with the market will consequently be of importance. Therefore, the aim of this study is to increase knowledge on how dynamic capabilities are created to address digitalization. The understanding of a phenomenon is increased when further characteristics can be discovered. In that sense, the knowledge provided by this thesis will be of a characteristic nature (Goldkuhl, 2011). Knowledge of a characteristic nature is described as knowledge about a categorized and researched phenomenon. The essence of this knowledge is to interpret and elucidate properties for a specific phenomenon (Goldkuhl, 2011).

4.1 Data collection

Our data collection is mainly based on secondary data gathered from sources the firms have published in their information releases. We mainly used the most related first-hand information the firms published themselves including firms' internal and external interviews, annual reports and news such as newsrooms or press releases. We also looked for other secondary data in journals, technical reports, and videos, which firms have published on YouTube. Gartner² was used to increase understanding of key concepts during this particular change effort for firms as well as case related data.

In terms of a qualitative content analysis method, this is especially important for assuring that the material and consequently the achieved results are valid (Weber, 1990). Throughout the analysis of the gathered information, our aim was to convey the implicit message of them rather than to rewrite their content.

We interpreted the collected material in order to identify how product-developing firms create dynamic capabilities to address digitalization. The aim for our study is not to find the one and only truth, but to increase the body of knowledge on how dynamic capabilities can be created and sustained.

² Gartner is the world's leading information technology research and advisory company (Gartner, 2015 <http://www.gartner.com/technology/about.jsp>).

During gathering the secondary data, we made a parallel judgment to be sure that data are reliable, suitable for the purpose of the work, and adequate enough. We did this by answering the points Sahu (2013) mentions:

(1) who collected the data, (2) where the data was collected, (3) what were the methods of data collection, (4) were the required methods followed properly, (5) what is the time of data collection, and (6) were the data collected at the desired level of accuracy? (Sahu, 2013 p.72).

- 1) Data were mainly collected by the people who work in the firms, who were in charge for conducting the research and producing information.
- 2) Since data were related directly to the firms, they were collected inside the firms.
- 3) To our knowledge from reading the data, there are both qualitative and quantitative methods of data collection. Some data are gathered through interviewing people at the firms, others deal with statistics.
- 4) We believe that the methods have been followed in a proper way. We have relied on the originality of the data. This is based on the fact that the data are published in the firms' related websites or under their authority.
- 5) We tried to consider the data publication dates, and tried to find the newest available sources. As a rule, we decided to put our focus on data published after 2010.
- 6) Considering the originality of the material and their importance to the companies, we expect that the data is collected at a high level of accuracy.

4.2 Choice of Firms

The selection of firms is important in qualitative content analysis approach, since the sample of firms have a direct impact on the outcome of the study's empirical result (Bryman and Bell, 2011). In addition, this thesis seeks to increase the body of knowledge on dynamic capabilities from an empirical perspective. The nature of dynamic capabilities (i.e. they are not possible to acquire by investment (Helfat et al 2007) require that they are empirically studied to portray how dynamic capabilities influence product developing firms.

The choices of organizations for the study are closely related to this thesis theme. SKF, IKEA, Assa Abloy and Electrolux are all global and market leading product developing firms operating in different industries. In regards to the focus of this thesis, digitalization impacts all these firms, making them a suitable choice for a comparison of the effect from digitalization between firms and industries. We believe that our choice of firms is valid to serve as a description on how incumbent firms create dynamic capabilities to address digitalization on the basis of the following argument.

21 of Sweden's 50 largest firms were founded before 1914 but none of the fifty firms has been founded after 1970. This entails a great deal of continuity and tradition, however many of these firms have undergone a lot of internal change regarding both production and ownership structure. At the same time productivity and growth has increased more in the

industrial segment than other sectors. It can be argued that, the main reason for an increase in productivity corresponds with digitalization and a focus on service -and knowledge within the production (Broberg, 2014). The increase in production has been a driving force towards globalization and the possibility to develop and maintain competitive advantage, the consequence is that firms need to find new value propositions to different customer segments and at the same time identify profitable customers that they can have long term relationships with (Broberg, 2014).

With digitalization and a decrease in transportation costs, and need for increased knowledge in the production process, there is a great deal to adhere to. Incumbent firms now have the possibility to coordinate production, distribution and marketing globally. Digitalization and less expensive transportation has allowed for new organizational structure outside the domain of big corporations, especially in knowledge intensive industries where niche products and particular competence is important to become successful. Competitiveness has increased, however to have a distinct advantage, firms need to find ways to leverage globalization and digitalization (Broberg, 2014).

4.3 Research setting

Assa Abloy is the world leader in door opening solutions with a strong connection to digitalization. Since the merger between ASSA and Abloy in 1994, the group has been grown from a regional to an international organization. The company has 43 000 employees in over 70 countries with SEK 47 billion in annual sales and is a fast-grower in the electromechanical security segment and has a leading position in access control and identification technology.

SKF is a global organization with 48 000 employees in 28 countries. The company is one of the leading providers of products and services in the ball bearing industry with more than a hundred years in business. They also offer technical support, maintenance service, production supervision and training.

IKEA, also a global company, both designs and sells ready to assemble furniture with stores in 46 countries and total sales of EUR 28,7 billion. IKEA currently employ 147 000 co-workers and are the world's leading furniture retailer. IKEA has been active in the furniture industry since 1948.

Electrolux is an international industrial group with the parent company AB Electrolux with 59 481 employers. The company manufactures home appliances such as, vacuum cleaner, refrigerator, freezer. Electrolux had acquired and merged a number of other large firms and market their products in over 150 countries under its brand names AEG, Simpson, Wascator, Westinghouse, Volta, Zanussi.

4.4 Data analysis

In this thesis, qualitative content analysis is used as the method for data analysis. Content analysis is originally a quantitative method. It can be used to develop an understanding of the meaning of communication and to identify critical processes. It is concerned with meanings, intentions, consequences and context (Elo and Kyngäs, 2008). Rather than focusing on the ways the data is gathered, content analysis tends to be a flexible approach for analysis of documents and texts in a systematic and replicable way aiming at quantifying the content out of pre-defined categories. Content analysis is originally used as part of a quantitative approach to describe the large materials and is still used in for example media research. However, content analysis can become a qualitative approach when the focus is on the interpretation of different forms of texts such as media documents, annual reports, business press, websites, observations, interviews, etc. rather than the production of a numerically based summing of selected parts of texts which is the goal of the quantitative approach. Qualitative content analysis is a process for identifying, coding and categorizing fundamental patterns or themes in the empirical material. The procedure regarding the coding of texts however, reminds often a quantitative approach and is derived from the quantitative tradition of content analysis (Bryman and Bell, 2015).

Content analysis is considered as a transparent research method in that it emphasizes on “objectivity” and “being systematic” in the procedures for assigning raw material to categories so that the analyst’s personal biases intrude as little as possible in the process (Bryman and Bell, 2015).

We formulated a set of procedures based on the nature of our research and its goals which have their roots in our learning of the content analysis as an objective, systematic method:

1. Keyword in content analysis
2. Coding of text
3. Word-frequency list

While we have chosen content analysis as our analysis method, the research takes an inductive analysis approach as according to Elo and Kyngäs (2008), Inductive content analysis is used in cases where there are no previous studies dealing with the phenomenon or when it is fragmented, which applies to our subject and is determined by the purpose of the study. The fact is that there are many theoretical studies on dynamic capabilities, the number of empirical studies however is scarce. Hence, we decided to base our study on an inductive approach. Based on an inductive approach, we move from the specific data to the general ones, observe particular instances, and at the end combine them into a larger whole; a general statement. After gathering the data, we organize them through coding, creating categories, and abstraction. The process of coding in our case includes reviewing the material and selecting certain keywords and phrases, the coding process itself, and making a word-frequency list all done in the NVivo software. This stage is followed by creating categories of related words and phrases. This is done to provide a means for describing the phenomenon, to increase understanding and to generate knowledge. This leads us to identify patterns of how such keywords are used in different firms and industries. Hopefully, in the abstraction stage,

this leads us to achieve an insight about the whole entity and to formulate a general description of the research topic through the generated categories.

According to our own understanding of Bryman and Bell's (2011) content analysis method, several strategies may be adopted and used for analysis of texts and documents, depending on the nature of the research and the context in which the researchers may find themselves. Therefore, it is important that researchers are clearly in line with what the study aims to contribute and which phenomena is to be investigated. In our case, we as researchers are outside the firms and try to examine how specific firms work and live in different industries. In order to carry out our task, we decided to analyse previous researches and other related material.

The aim of the content analysis method is to make a set of the meaningful implication of texts. Meaningful implication refers to conclusions from different types of texts such as a message, news, etc. To make the set of conclusions, texts of the materials are treated according to the method procedures. Each procedure in content analysis performs different operations and therefore procedures must be followed systematically.

The central focus in content analysis is to select data in which the word or phrase is fundamental for the analysis. In this research, we have used Word-Frequency List (see 4.4.3 for a description) and Keyword (see table 1 in 4.4.1) in content analysis to find the most relevant words that occur. The following describes various procedures of content analysis methodology that this study has employed.

4.4.1 Keyword in Content Analysis

In the first stage, we selected a number of keywords in order to better understand the context in which the words appear or are used in sentences or phrases.

“Through content analysis, it is possible to distil words into fewer content-related categories. It is assumed that when classified into the same categories, words, phrases and the like share the same meaning. The key feature of all content analysis is that the many words of the text are classified into much smaller content categories.” (Elo and Kyngäs, 2008, p.108).

We created our keyword list, where the selected words are shown in variation or synonyms and their area of use (Weber, 1990). We have used this method to make structured information. This increased our ability to understand the relationships between selected words and their usage.

We have selected our keywords from all the materials we collected from the different target firms, where words were used in the most relevant contexts for our case. It should be mentioned that some keywords occurred in most of the investigated materials, therefore we needed to determine the relevance and the relationships between the words and the whole text. Such keywords are for example innovation and technology. In some cases, we had to replace keywords to their synonyms, depending on the specific terminology that was used in particular organizations and their own definition of keywords.

Search word	Keyword	Source
Technical innovation	Technical	Corporate website, online material
Sustainable business	Investment	Newspaper, magazine
Creating capabilities	Capacity	Online material, newspaper
Innovative digitalization	Digital	Corporate website
M2M ³	Innovation	Corporate website, newspaper
IoT ⁴	IoT	Newspaper, online material, scientific article
Operating context	Product	Corporate website
Digital platform	Platform	Corporate website, newspaper, online material
Pace of change	Services	Newspaper, online material
Competitive advantage	Competitiveness	Corporate website, newspaper, magazine
Knowledge management	Knowledge	Newspaper, scientific article
Asset management	Investment	Corporate website, newspaper
Digitalization	Digitalization	Corporate website, newspaper
Mobility	Mobility	Newspaper, Corporate website, online material

Table 1: the table shows relevant keywords respective sources

³ Machine to machine

⁴ Internet of Things

4.4.2 Coding of text

After selecting the keywords, we converted the texts into pdf and word formats readable in NVivo software. We then marked those keywords in the texts which was actually the coding stage (nodes) in the NVivo software. This step is called coding of text.

Coding is significant in the content analysis process for this step provides researchers with valuable insights about the phenomenon (Bryman and Bell, 2011; Schreier, 2012). The reliability of the coding and consequently the reliability of the research is highly dependent on this stage. We have used NVivo to encode texts and result of this operation was used for processing in other phases of the content analysis process.

4.4.3 Word-frequency List

In the third stage, we used NVivo software to create a word-frequency list; the most commonly used words and phrases. As Weber (1990) notes, researchers can concentrate on the most commonly used words in a text to omit words that are not of interest. In this way, researchers gain understanding of the most used words in the investigated firms. This can help to analyze high-frequency words. It is necessary to determine the unit of the analysis, whether it will be a word, phrase or a sentence (Bryman and Bell, 2011). They state that decisions about what to be counted is to be deeply affected by the nature of research question. Depending on our research question, and the difference of the industries of our selected firms, we used both words and phrases as our units of analysis. We then found out that for example words such as innovation, resource, development, product, to name a few, were used frequently in the different contents related to digitalization in product-developing organizations. The chief objective in recording such data is to map the most recurrent words/phrases in the respective content and to reveal some of the mechanics involved in the production of information of the research subject.

We also discovered that in some cases, different firms can have different definitions of the same word(s) or phrase(s) depending on the nature of their related industries. For example, SKF and Assa Abloy use the phrase “asset management” in two different ways in terms of their services or solutions to clients.

4.5 Software

Computer-aided content analysis is the use of software programs in order to simplify the analysis of textual data. Using a computerized method in preference of a manual method is preferable in a number of ways. A computer-aided approach does not require coders to read the text and certain code terms that are of significance. It also automatically searches terms or phrases in a text and codes them (Bryman and Bell, 2011; Schreier, 2012). There is a number of software available for analysis of qualitative material. We had two software alternative to choose: RQDA and NVivo. We decided to work with NVivo for it is firstly easier to manage

a large amount of material and searching through them compared to RQDA⁵. Secondly, we discovered that NVivo is a more accessible software in terms of the ease of interaction and the options it offers, resulting in a smooth work flow. Thirdly, we could copy categories into different places in the hierarchy through which different versions of coding frames available at the same time.

Besides, NVivo offers us to search quickly through the texts and gathered material. The search functionality helped us to make specific searches on text or nodes and save the achieved results. Further, another useful capability of NVivo is in making memos as a container for ideas, illustrations, notes or making models at the beginning of a project. Coding with NVivo was accomplished by the use of codes that were later applied in the coding process. The software contains two different types of nodes, namely free nodes and three groups of tree nodes.

4.6 Reliability and validity in qualitative research

In quantitative and qualitative research, reliability and validity are important criterias in establishing and assessing the quality of conducted research. Therefore, we first give a brief introductions for the two concepts and continue to describe the appropriate concept(s) or forms on which we have assessed the reliability and validity of our research. In the case of reliability, we satisfy ourselves with thoughts on reliability in the context of content analysis which Weber (1990) brings in his book *Basic Content Analysis*. One distinction worth's mentioning here is that according to our understanding from reading different discussions of the concepts, we realized that while reliability in content analysis is more a form for assessing the coding process, validity is more a form for assessing the whole entity of the research work. Reliability is about details; validity is about the wholeness. We also had a comprehensive review on different statements on validity and at the end found that Krippendorff's *product oriented validity* or *pragmatical validity* is mostly appropriate to our work.

Two definitions

Reliability: Reliability is particularly more connected to the quantitative research and questions the repeatability of the results of the study. It is more about consistent measurements (Bryman and Bell, 2011).

Validity: Validity is the most important criterion in research that according to Bryman and Bell "*Concerns with the integrity of the conclusions that are generated from a piece of research.*" (2011). According to Weber (1990), validity is "potentially confusing because it has been used in a variety of ways in the methods literature".

⁵ R-based Qualitative Data Analysis, is a computer assisted qualitative data analysis.

Reliability

In the context of content analysis, Weber (1990) defines three types of reliability: stability, reproducibility or intercoder reliability, and accuracy. Weber defines these three as criteria for reliability assessment. As we have mentioned before, coding is the most significant stage in content analysis, thus the reliability of the research is dependent in the reliability of the coding, therefore, we have considered these criteria throughout the coding process to keep consistency and to assure that our work is “reliable”.

Among these types, stability and reproducibility are more relevant to the current research, therefore we do not provide any description on accuracy.

Stability “refers to the extent to which the results of content classification are invariant over time. Stability can be determined when the same content is coded more than once by the *same* coder. Inconsistencies in coding constitute unreliability. These inconsistencies may stem from a variety of factors, including ambiguities in the coding rules, ambiguities in the text, cognitive changes within the coder, or simple errors, such as recording the wrong numeric code for a category. Because only one person is coding, stability is the weakest form of reliability.” (Weber, 1990: 17).

Reproducibility, “sometimes called intercoder reliability, refers to the extent to which content classification produces the same results when the same text is coded by more than one coder. Conflicting coding usually result from cognitive differences among the coders, ambiguous coding instructions, or from random recording errors. High reproducibility is a minimum standard for content analysis. This is because stability measures the consistency of the individual coder's private understandings, whereas reproducibility measures the consistency of shared understandings (or meaning) held by two or more coders” (Weber, 1990).

As we mentioned in the coding of text section, after selecting a selection of keywords, we converted the texts into pdf and word formats readable in NVivo software. This constituted the coding part. Our approach for keeping the stability in our coding was to do the whole process together; the coding was done by more than one coder to avoid possible inconsistencies. In regards to reproducibility, the coding process was a result of a shared understanding (meaning) held by the two of us. By considering these steps in the process, we tried to achieve reliability in coding and in the content analysis. We would also mention that the issue of reliability according to Weber (1990) is especially important when the content analysis is human-coded. In our case, it is computer-coded.

Validity

In his paper, “*Validity in Content Analysis*” (1980), Krippendorff brings a coherent discussion on validity and its forms. Among several forms of validity that he mentions, *product oriented validity or pragmatical validity* was interesting for us:

“Validation is essentially a process of justifying the transfer of validity from established

theories, from research findings that one knows to be true, or from processes that actually exist to other theories, findings or processes whose validity is in no doubt.” (Krippendorff, 1980; p. 75). “Product oriented validity or pragmatical validity relies on information about what the analytical results claim. The rules of induction and deduction are essential to validation.” (Ibid; p. 74,75).

Based on what is understood from the above discussions on pragmatical validity, we have extracted two points that express our perspective on validity in the context of our work:

1. Pragmatical validity is a system for comparing the results of the empirical data with established theories, true previous research findings, and evidence whose validity is in no doubt. This covers the range of our collected data.
2. Pragmatical validity justifies the results of a content analysis without references to the structure of the underlying process. Its objective is to assess the work in its wholeness.

5. Empirical findings

This chapter outlines our empirical findings by presenting four market leading firms in different industries, namely, Assa Abloy, SKF, IKEA and Electrolux. Moreover, we use our theoretical lens to explain each case in separate sections. Finally, at the end of each case a table is illustrated in order to clarify resources and capabilities in each step of option cycle.

5.1 Assa Abloy

The lock manufacturing industry where Assa Abloy is operating in is going through a substantial digital transformation. The impact of digitalization in the industry has transformed the door key, from a physical to a virtual object. Assa Abloy is in the forefront of this transformation in the industry, 50 % of their total sales come from electromechanical locks. Assa Abloy is also committed to digital disruptive innovation in product as well as process innovation. This has earned them a spot on Forbes 100 most innovative firms list. A large amount of the customers in access control segment demand innovative products that meet their expectations. The firm’s strategy is to be the world leader in emerging markets (Assa Abloy, 2015c). Growth has been secured by an aggressive acquisition and merger strategy (over a hundred acquisitions since 2005), giving the firms access to new markets, products and technology (Assa Abloy, 2013). The rapid expansion has been possible by identifying viable candidates as well as an effective acquisition -and integration process into the group (assaabloy.com, 2015b). The large amount of acquisitions has given the firm preferential access to new capabilities, resources and emerging markets.

SEOS is a mobile platform developed by Assa Abloy that provision digital keys and secure identities utilizing NFC-compatible smartphones and cloud-based services. The technology allows doors to be opened by holding the smartphone over a digital lock or reader. The platform is the world’s first for issuing, revoking and delivering digital keys. The technology allows for the replacement of mechanical locks and access cards and can be applied to both private and commercial properties. SEOS is compliant with open standards in the security industry and works with all NFC compatible phones (Assa Abloy, 2015a).

To aid Assa Abloy leverage future digital options, both technological and organizational resources has been developed and reconfigured. This entails to identifying, developing and realizing digital options when developing the SEOS platform. Starting off with identifying, these capabilities entail to leveraging digital innovation as well as capture future trends, create relevant products and securing important technology and knowledge. Assa Abloy's emphasis is on developing products that satisfy customer needs and are possible to upgrade and exchange. To achieve this, resources needs to be optimized, as well as building capabilities to closely monitoring trends and customer preference.

Further, the firm has introduced the concept of innovation management. This entails to managing digital innovation and removing products of less significant value to the firm. By eliminating products that is not value adding, more resources are available for new products with greater potential of adding revenue to the firm. In addition, new ideas are scrutinized in terms of being a fit for the firm, stemming from the fact that if too many ideas enter the innovation system, it risks clogging up and create inertia. In a general sense, this entails to both developments of strategy and concepts as well as education and networking. New ideas are often tested in pilot projects for viability. New digital products are also discovered by going out to customers and subjecting themselves to the customer everyday life (Assa Abloy 2015e), as part of a programme developed by the firm that is elucidated below.

We have become 54 % more effective in creating value from innovation in five years. There is a lot of reasons for that change but innovation management is one of them"

Åsa Christiander, Global Innovation Manager at ASSA ABLOY (Motivation 2014).

In order to more dynamically capture the different customers' various needs, a voice of the customer programme has been developed. The purpose of the voice of the customer programme is to bring the entire firm closer to the customer and understand their particular needs and use and diffuse that knowledge in product innovation. The intent is to better leverage the variance of customers a global firm has with customer with different context and originates from a number of regions and countries. The program operates in cross-functional teams with members from R&D, product management and marketing and sales all work as a cohesive unit in understanding the customer need. By placing different skills and competence in direct relation to customer need it is perceived that more relevant products can be launched on specific markets (Kris Morrissey Global Voice of the Customer Manager 2013). In order to observe and analyze the future of digital locks and capture the voice of the customer, the firm has created Future Lab, an open Internet forum where input from customers and trends are monitored. The forum works as a resource to the R&D department and incorporate the voices of security professionals around the world (Assa Abloy, 2015b)

To facilitate matters, the firm has established a Product Management System where trends, planning and technologies can be closely monitored and analyzed in a systematic way (Assa Abloy, 2014b). The Product Management system aids in leveraging digital options by prioritizing ideas that is submitted, creating more available resources for digital options of

significant value to the customer (Motivation 2014). Also Assa Abloy uses acquisitions as a strategy, i.e. identifying digital options when acquiring technology and competence they perceive as important and aligned with strategic goals. An important step in developing the SEOS technology was to acquire HID Global in 2000, an industry leader within the area of management and creation of secure digital identities, thereby gaining access to the technical foundation for the SEOS ecosystem. The acquisition of HID Global was the starting point for the release of the SEOS ecosystem twelve years later.

Moving on to developing digital options. Assa Abloy built capabilities to reuse existing products, creating new product, co-design digital solutions and enabling digital resources as well as enable multi-purpose product. Assa Abloy engaged in a partnership with Screen Interaction, a design and innovation firm, to develop their applications and services for access control. To leverage the complexity in transforming the key from physical to digital, the firm turned to external innovation capabilities and Screen Interactions cross-functional team of interaction designers, usability experts and developers. The technology was tested in various pilot projects, which allowed for refinement of the final solution (Screen Interaction 2015). Another pilot project was carried out in 2011 with external partners in hotels. The solution allowed for preferred guest to bypass reception and open their hotel room by checking in and out and receive their key via the mobile application (Assa Abloy, 2011). The pilot project was a success and the decision was made to go ahead and utilize the technology in their other markets as well. The acceptance for the technology in different markets was made possible by creating an internal and external partnership between HID Global, Sargent, Corbin Russwin and Yale as well as hotel industry experts at VingCard Elsafe and co-designing the platform by exploiting competence from key firms within the Assa Abloy group.

By utilizing existing and acquired products during development, the technology has been readily available to various users needs and a number of markets by offering an infrastructure for digital keys (Assa Abloy, 2012). To utilize the technology further, many of Assa Abloy's electromechanical solutions are compatible with the SEOS platform. This is made possible through a strategic initiative of developing global common product platforms, i.e. group-wide platforms that can be used by different firms (as well as markets) part of the Assa Abloy group. To meet the variety in customer demand in different markets, the platform is possible to adapt to specific local market's needs (Assa Abloy, 2010). Further, the firm has developed a cloud architecture that is working as an enabler of digital options. To meet the market demand to create digital identities, customers can subscribe to Assa Abloy and their partners digital identity management and access authentication solutions via cloud services (Assa Abloy, 2014a).

Many electromechanical solutions are compatible with ASSA ABLOY's Seos ecosystem for digital keys (Assa Abloy, 2013).

Finally realizing digital options. Assa Abloy built capabilities to increase distribution of product, promote product variation, making products available and prioritizing digital innovation. The SEOS technology is also available for other digital solutions, such as

utilizing a phone or a wearable to verify identities, for example payment systems. This allows for the platform to expand by licensing the technology to other solution developers outside the current habitants of the platform, i.e. firms in the Assa Abloy group (Assa Abloy, 2015a), as well as promoting solutions other than "simply opening the door", i.e. increasing the number of services and products powered by the platform (Assa Abloy, 2014a). This entails to drive development towards a broader range of interoperable product that use the platform (Hidglobal 2015). This enables the technology to be used in other markets and build upon on existing product features. The technology is made available to other solution providers by providing Software Development Kits (SDK) as well as cloud services that can be utilized. In order to prioritize digital options, Assa Abloy has created a global council. The council is a cross-functional setup (e.g. innovation and design management) with a strong focus on product development and product management from the various divisions. The councils also contain all the Chief Technology Officers from the various divisions and innovation is coordinated thru this council. This organizational resource is designed to prioritize digital options, by setting measures and targets for the innovation process, e.g. realizing digital options that are sustainable (Assa Abloy 2015b).

The capabilities and resources developed by Assa Abloy are summarized in the table on the next page.

Option cycle O = organizational resource T = technical resource	Resources	Capabilities
Identifying options	Product Management System (T)	Leveraging digital innovation
	Innovation Management (O)	
	Future Lab (T)	Capture future trends
	Voice of the customer-program (O)	Create relevant products
	Acquisition -and integration process (O)	Securing knowledge and technology
Developing options	Integrated sustainability approach (T)	Reuse existing products
	Partnership Screen Interaction (O)	Creating new product

	External and internal partnership (O)	Co-design digital solutions
	Cloud-based infrastructure (T)	Enabling digital resources
	Flexible infrastructure (T)	Enable multi-purpose product
Realizing options	Licensing (O)	Increase distribution of product
		Promote product variation
	SDK (T)	Making products available
	Global Council (O)	Prioritizing digital innovation

Table 2: the capabilities and resources developed by Assa Abloy

5.2 SKF

The SKF Group is the leading global provider of products, services and solutions for rolling bearings, seals, mechatronics, services and lubrication systems. The services involve technical support, maintenance services and condition monitoring as well as asset efficiency optimization, engineering consultancy and training. Being an innovative-driven company already from the start, with the self-aligning ball bearing, the firm is now trying to innovate and capitalize in the digital space. Successfully embracing digitalization is increasingly important in the manufacturing industry today. Tom Johnstone, the former CEO described the current digital transformation of the industry as: *"The industry is going through a renaissance"* In particular, mobility has been identified as a key issue in the industry in gaining complete advantage (Forbes 2015). The industrial arena has become increasingly permeated by digital technology, which forces firms to invest in and build digital capabilities and leverage digital innovation. . In the lines of this, SKF's group management has recognized mobility as one of the six strategic investment and focus areas (Great IT, 2012). However, the benefit with investment in industrial connectivity is an extension of the firm's capabilities to increase the range of digital solutions to different markets. *"Embracing industrial connectivity is opening up new markets for us"* (Tom Johnstone Former CEO 2003-2015) Drawing from this SKF has continued their investments in digital sales processes, production and maintenance service offerings⁶.

CEO's that prioritize mobile technologies are leading the revolution in the industry (Forbes 2015). SKF has a strong focus on R&D, which has concluded in several innovations, standards as well as products and services. The firm is making the transition, from selling components to include digital systems in their market offering. To make the transition from traditionally being a firm with limited focus on digital technologies to make investments in mobility, the firm has doubled their investments on innovation the last seven years to leverage the gap between incremental product innovation and digital innovation. Investments

⁶ SKF takes next step in smartifying the industry. Dagens industri. [online]. Accessible: <http://www.di.se/finansuell-information/dagens-rapporter/?NewsId=8439981d-4321-472c-af34-976f5a9f2e53>

in innovation are perceived as an important growth factor within the firm (Tom Johnstone, SKF, speaking at the Annual Convention, 2014).

The commitment to utilize mobility is consequently strong in the firm. From the pre-study on how to utilize mobility within SKF to implementation took only three years (Tom Johnstone, SKF, speaking at the Annual Convention 2014) Over 30 mobile applications have been developed; which empower the personal and customers in making calculations, training, data collection and access to information and knowledge. In line with their strategic initiative, the firm has developed a platform called SKF Enlight. The platform consists of an application called Data Collect, a cloud-service and digital sensors. They are part of a digital package of smart products enabling the integration of condition monitoring into mobile devices⁷. The solution makes it possible to collect and visualize data from machines and devices equipped with sensors that measures vibration and temperature and diffuse data to smart devices. The data produced by machines is secured by storing data in a cloud service powered by SKF. Using a cloud service, enable the data to be reviewed by experts at a remote diagnostics center. This opens up an array of services that SKF can offer to their customers.

Beginning with identifying digital options. SKF built capabilities to identify new ideas, enabling digital resources, leverage innovation and promote digital solutions. The firm arranges innovation jams on regular occasions. In these jams, employees come together to visualize and brainstorm ideas that can improve their daily operations (SKF: Creating a mobile strategy, 2014). During the initial phase, an idea for an application that is brought forward is matched against the effort that is required versus gains. New ideas should also comply with SKF's mobile strategy as well as harmonizing with a number of criteria established by SKF for the development of applications. Compliance with the mobile strategy entails to whether, the option is merely replacing old technology or is innovative as well as fit against current processes (SKF: Creating a mobile strategy, 2014).

To enable the digital resources, the data being collected by the applications is sent to the back-end system, where it is logged in a separate database (SKF: Most App demo, 2014). This enables SKF and their customers using the applications to analyze and act upon the collected data. During sales with customer, the sales personal have extensive material at their hand when talking to customers about SKF's products. To empower the personal and make the meeting with customers more efficient, the firm has digitized all of the material into an app. The applications are secured by the use of security measures such as VPN. This allows for the staff to increase their level of effectiveness by being able to access firm sensitive data from any location, employees report efficiency gains up to 10 %.

During development of digital options, SKF built capabilities to acquire competence and knowledge, enabling digital services, streamlining resources, enabling multi-market solutions, creating customized solutions and creating multiple income streams. From a

⁷ SKF takes next step in smartifying the industry. Dagens industri. [online]. Accessible: <http://www.di.se/finansuell-information/dagens-rapporter/?NewsId=8439981d-4321-472c-af34-976f5a9f2e53>

internal perspective, the firm decided to standardize on only one platform after reviewing the different available platforms. After reviewing the different platforms and some consideration, SKF decided to partner with Apple. The choice to standardize on the iOS platform allows the firm to better optimize their resources during development of digital options from an internal perspective. For example, the firm has created a solution partner network. They started off with developing applications in-house but soon learned that the project was in need of more manpower. By establishing a partner network, the firm has created the capability to recruit necessary manpower and competence when necessary and in a more dynamic fashion. From an external perspective the mobile application developed by the firm are also available for both the Android -and iOS platform. In addition, the digital package mentioned earlier requires firms also to purchase hardware developed by the firm (for example the vibration sensor used in collaboration with the data collect application).

As mentioned, mobility is a key factor that permeates SKF. During development of digital options, new technology is developed and built upon their digital properties with mobility in mind. Further, the general idea is to create a platform, which can serve to more markets. This extends the digital space and also ensures new systems become an integral part of mobility within the firm. During development of applications, there is ongoing communications with the stakeholders to ensure that the development team is on the right track (SKF: Designing and creating native iOS apps, 2014). Further, digital options are used together with a cloud service, which creates no need for instalments or updating, as it is distributed as Software as a Service (SaaS). To be able to make use of the services in risky environments, the firm is collaborating with the partners and OEM to make mobile units more robust. The partnership enables the digital technology to be utilized further in hazardous industrial areas and increases the number of environments the technology can be used in (SKF, 2015b).

To get closer to their customers and distribute their industry knowledge to customers and building customized digital solutions, the firm has developed what they call Solutions Factories. The aim is to create a local hub containing global capabilities within SKF. Customer get access to the firm's digital technology and their service offering as well customized solutions. Digital solutions for predictive machine conditioning are developed by dedicated teams that is assembled based on requirements for the specific project, i.e. cross functional teams. Remote monitoring via cloud services (mentioned above) are part of the Solution Factory concept. The concept works as a gateway to help their customer leverage competitive environments by allowing direct access to the firms accumulated knowledge and competencies. Solutions Factory is rolled out globally, early 2014 a total of 27 Solution Factories was established around the globe with more to come. As the network grows, the diffusion of accumulated knowledge is shared within the network. With aid from this knowledge, the idea is to promote innovation and customized solutions at a faster pace and thereby aiding customer to better leverage their competitors (Evolution Magazine, 2015). Service contracts are offered to customers choosing the SKF technology, ranging from the bare minimum to complete services to implement and run digital predictive asset management programs.

Lastly realizing digital options. SKF built capabilities to making products available and prioritizing digital solutions and enabling fast decision-making. The mobile units used by employees and customers come packaged with preloaded software. This enables the units to become readily available for different markets and customers. To facilitate matters, SKF also uses an MDM-service to deploy mobile units to their customers and employees. Part of the MDM-service is to make the mobile applications available to employees, through an app catalogue (SKF: Managing and deploying devices with MDM 2014). The firm's applications are accessible both internally and externally. Externally the applications are readily available in the App Store and Google Play. By distributing digital solutions to app store platforms, the availability of the digital technology increases.

In order to realize mobility within the different layers of the organization, the firm has created a separate team called Connectivity Room. Their objective is to develop digital, machine-to-machine and mobile solutions, serving both SKF and their customers and ensuring compliance with the mobility strategy. It was perceived that to leverage digital technologies with a holistic perspective both internal and external, a different team was required, operating outside the normal organizational structure. The team reports directly to the CEO and group management (Great IT, 2012; SKF: Creating a mobile strategy, 2014). It was also decided that the digital initiative should be business driven, hence reporting directly to the CEO allows for decisions to be made at a faster pace and thereby avoiding inertia in the decision making regarding digital options. Digital options can also be leveraged against firm strategy and purposefulness for the larger organization.

The capabilities and resources developed by SKF are summarized in the table below.

Option cycle	Resources	Capabilities
Identifying options	Innovation Jams (O)	Identify new ideas
	Dedicated database (T)	Enabling digital resources
	Security measures (VPN) (T)	
	Connectivity Room	Leverage innovation
		Promote digital solutions
Developing options	Solution partner network (O)	Acquire competence and knowledge
	Cloud-based infrastructure (T)	
	Digital sensor (T)	

	Mobile applications (T)	Enabling digital services
	Digital service platform (T)	Creating multiple income streams
	Internal iOS platform (T)	Streamlining resources
	Partnership with OEM and other partners (O)	Enabling customized product
	Solution Factory (O)	Creating customized solutions
Realizing options	App catalogue (T)	Product availability
	App store and Google Play (T)	
	Preloaded software (T)	
	SaaS (T)	
	Connectivity Room (O)	Prioritizing digital options
	- relationship to - Group Management (O)	Enabling fast decision making

Table 3: the capabilities and resources developed by SKF

5.3 IKEA

In line with Customers' more sedentary home lifestyle, E-commerce becomes more trendy and important in the furniture industry. In other words, the effects of digitization have moved customers' focus from physical stores to virtual online shop. This means that firms in the furniture industry must react quickly and follow market trends, and pay attention to provide consumers effective ways to approach their desires. Thus, adapting and developing services by digitizing them is a way to offer customers the possibility to put their own signature on the products they need.

Since 2004 IKEA has invested in establishing the firm's presence in digital channels. This is a result of an uncertain market with a high rate of change in the furniture industry. In 2004, in line with high uncertainty in the digital market, IKEA has developed its digitalization processes in order to cope with the new digital market trends by launching its first online version application. This accomplishment was IKEA's first step towards creating a catalogue for the digital ages. (IKEA: The making of the IKEA catalogue 2014, 2015). In line with IKEAs' digitalization efforts, the IKEA concept partly includes the so-called democratic design process, which involves customers in the process of delivering the purposed product by saying, "*we (the company) do our part, and you do your part (consumers)*". (IKEA:

Doing it a different way, 2015). For example, the company's digital catalogue provides customers with information about the products in an interactive way. Similar, the digital catalogue facilitates customer decision-making (IKEA: The making of the IKEA Catalogue 2014, 2015). Thus, IKEA has expanded the assets to new markets, products and other activities. *“Going digital has meant the catalogue can reach even more people and can be adapted in more interactive ways”* (IKEA: The making of the IKEA Catalogue 2014, 2015).

In 2011, in line with further development of digitalization process, IKEA created the first version of the digital catalogue as a mobile application, with a main goal for inspiration, ideas, knowledge required in homes. Later in 2013, in line with the IKEA's going digital process, the digital solution was extended even more. This service offers customers digital services in terms of two mobile applications, namely; IKEA Store and IKEA catalogue. Noteworthy, in this paper, there is IKEA catalogue that will be investigated and this service uses by customers and retailers. By using digital catalogue applications, customers can initially look through the digital catalogue and prepare before their shopping experience when visiting IKEA's physical stores. In 2011, 870 million users visited IKEA's website. Later in 2013, IKEA realized its investments in digital age when the number of users reached 1.5 billion visits. In this regard, the positive change of increased number of users also enables the firm to absorb as much as customer feedbacks as possible (IKEA i din smartphone eller surfplatta, 2015; IKEA Group FY 14 yearly summary; Catolica Lisbon Business School, 2013).

More specifically, the mobile application allows customers to see a room in 360 degrees while Placing IKEA's furniture in the room. The application offers possibilities such as 3D animation in form of videos, images and millions of 3D models to assist customers to decorate their homes (IKEA Group FY 14 yearly summary). Through the digital catalogue, customers can scan pages of the printed version for attaining information about the products and the stories behind them (IKEA: The making of the IKEA catalogue 2014, 2015). The catalogue application offers value-added services to customer in terms of user experience, which enables the firm to use all the feedbacks needed for further product development. Thus, the catalogue application facilitates the firms' decision-making process, which aids the firm to respond rapidly to market changes and acquire sustainable competitive advantage (Olenski, 2013). Hence, digital options can be derived from the development and improvement of the existing resources and this is the main outcome in the IKEA's case. IKEA constantly tries to find channels in the market as a source of information about the market trends and how life at home must be developed in each market in order to satisfy customer- and market needs.

Concerning the identification as the first step of the option cycle process, the Inter IKEA Systems BV - a division of Inter IKEA Group –identifies new ideas, offers retailing solutions and better working strategies. These services or products are known as “IKEA know-how” which will be available and accessible to all IKEA retailers under franchise agreement. Simultaneously, IKEA retailers share their knowledge, experience and ideas. In this way, the mutual knowledge sharing in the whole company drives the IKEA concept towards a living

dynamic concept that always develops and expands. According to IKEA, the firm constantly runs regular market research to provide retailers with tools and reports needed for business improvements. At the same time, IKEA uses all the feedback for measuring customer satisfaction, and also, measuring how retailers have positioned the IKEA brand, and how competitive they are in each market. In that sense, it is vital that firms strive for promoting customer experience. In this regard the CEI Survey result demonstrate that 86% of buyers will pay more for a better customer experience (Crandell, 2013). Additionally, IKEA aims to find new solutions for improvement of its product range, and IKEA website. Equally important, the company also collects and analyzes various insights into macroeconomic factors (IKEA: What we offer to IKEA retailers, 2015).

Furthermore, IKEA have an innovation laboratory owned by the Inter IKEA Systems BV, called Space 10, which consists of professors, students, designers, artists and producers collaborating in workshops and exhibitions (Rhodes, 2015). The aim of the lab is to capture progressive thinkers for solving the coming decades' home design problems. The concepts that are developed in the innovation lab are later reviewed and collected by a small Danish design firm called Rebel Agency.

Additionally, the intent with establishing Space 10 is to create new product ideas, which IKEA can distribute to the market or used in business. Space 10's activity is to discover future urban life based on different themes. Further, every lab runs for three months in order to make prototypes of ideas. The results are discussed among all designers (Brownlee, 2015).

Besides, it is worth mentioning that knowledge sharing and future ideas are captured internally through IKEA Inside or ico-worker as the IKEA's inter-communication website. Ico-worker is a platform for all IKEA employees where the employees can log in to the website and find all types of information, such as HR- information, benefits portal and career paths. Ico-worker is a global intranet with a local focus on an amazing scale, which have authority in 41 countries with an average of 70000 monthly visitors. There are more than 100 geo-targeted local intranets and IKEA Inside is the merge of these intranets. This is IKEA's strategy to *successfully promote sustainable innovation to co-workers* (Bright, 2015).

This global local approach does not end here. In addition, IKEA provides a staff social media that is based on an informal network platform called Yammer⁸. Instead of geo-targeting the network, Yammer encourages collaboration in terms of idea and innovation sharing through departments and borders. It is IKEA's way of promoting sustainable innovation by its employees. Yammer is a central hub for information through which the same customer questions and solutions to the questions are universally searchable by IKEA's employees (Bright, 2015; Älmhultsbladet, 2013). Yammer feed the product innovation proposals to "My IKEA Product Idea", that enables employees to share their new product ideas and creating linkage to IKEA's development team in Sweden. This is a direct line between those who have new ideas and those who can make it real (Bright, 2015).

⁸ Yammer is a private social network that helps employees collaborate across departments, locations, and business apps (www.yammer.com).

Thereby, the first step of the option cycle process also promotes future digital investments for further development of both technical and organizational resources. For example, IKEA acquired augmented reality (AR) technology⁹, although it was not used in the IKEA's catalogue application. Instead, based on the results of a research carried out by the retailers, the Inter IKEA Systems BV developed the AR technology even further. The conducted research pointed out that almost 75 % of consumers are not aware of the size of their homes, and therefore how the furniture might look like. Indeed, the aim of this attempt was to enrich its application and generate an engaging content, which allows customers to explore the products. (Natalie, 2014).

"We found That around 14 per cent of people have Bought a piece of furniture That does not fit When They get it home," he Reveals. "We also Learnt that more than 70 per cent of people do not even really know how big Their homes are. We wanted to solve this problem in an easy and fun way through our app. " (Natalie, 2014).

Experts from different parts of IKEA created the printed catalogue served as the foundation to the digital mobile application in eight months from idea to execution.

"It involves many competencies from across the IKEA world. Art directors, photographers, interior designers, copywriters, editors, image-producers, product coordinators, seamstresses, carpenters, technicians and 3D artists - all add to the most popular free home furnishing publication in the world." (IKEA: The making of the IKEA catalogue, 2015).

With regards to the development as the second step of the option cycle process, digital catalogue has been developed and improved every year by including new features. IKEA digital catalogue was created through the collaboration between different groups such as a creative-team called "Creative Hub" at IKEA Communications AB, which carried out many ideas for the IKEA's Communications. Also, the "CGSociety" which is an external firm engaged in the IKEA's development process by developing 3D images and utilizing advanced computer graphics to create realistic images of products (Schultz,2005; IKEA: The making of the IKEA catalogue, 2015). Moreover, IKEA outsourced the development of the AR technology on the digital catalogue application to a firm called Metaio. In order to adapt and utilize the AR technology on the digital catalogue, Metaio integrated the technology with 3D pictures on the mobile devices supporting 3G&4G (kristiel, 2014).

As demonstrated in figure 3, the development of the digital catalogue is monitored and financed under the control of the Inter IKEA Group and its underlying divisions, which works to ensure constant development of the IKEA concept know-how, which will be transferred and provided to the franchisees worldwide (IKEA: Inter IKEA Investments AB, 2015). Inter IKEA Group is organized into three divisions with the franchise group as the core division. This division together with inter IKEA systems B.V is the owner of the IKEA

⁹ AR, the technology that shows the reality displayed by camera images and amplified using GPS technology and compass (Lang and Sittler, 2012).

concept, franchises systems, methods and solutions to IKEA's retailers i.e. franchisees, operating under the firm's trademark in all markets. In addition, the finance division is responsible for investments in different areas of the organization. Besides investment activities, this division also aims to ensure financial stability and create long-term value (see Figure 3) (IKEA: Inter IKEA Group Organisation, 2015).

Inter IKEA Group Organisation

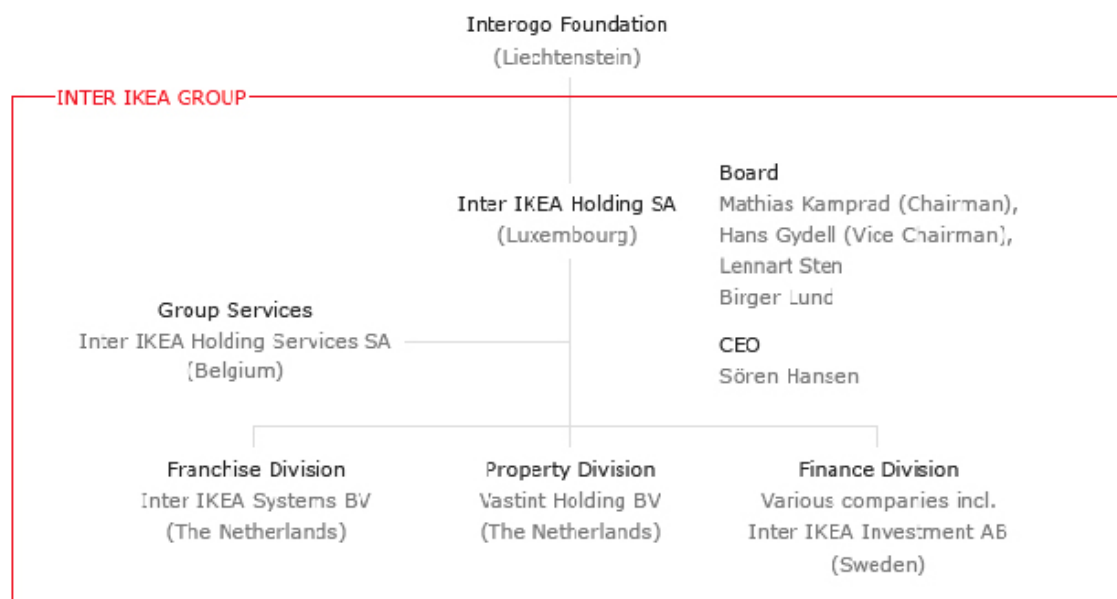


Figure 3: a simplified picture of Inter IKEA Group Organization and its underlying divisions (IKEA: Inter IKEA Group Organisation, 2015)

As mentioned, the mobile application development was partly outsourced and conducted through multiple third-party firms (Forbes, 2012). In recent years, the mobile application has been developed for later versions and additional functions. For example, the Omni-channel¹⁰ List is one of the developed functions that allow users to download, and list the favourite products, or send them right to the digital shopping carts.

The digital catalogue applies AR technology, which allows the users to place 3D models of IKEA furniture in real extent of their homes (Forbes, 2013; Hamstra, 2014). Furthermore, the AR technology has been developed further by IKEA, in terms of expanded capacity. The development of this function is happening presently and has been successful for the company, in the sense that the function has extended the firm's capability. This is in line with what IKEA's basic concept is all about; developing creative quality, and keeping costs low (IKEA: The making of the IKEA Catalogue 2014, 2015).

"The number of images needed for the catalogue keeps growing as new IKEA markets

¹⁰ Omni-channel is a strategy that offers the customers various ways to access to the products, the ability to have a better shopping experience, and evaluate the product before making a purchase (Hamstra, 2014).

emerge. 3D imaging is the most practical way for us to increase production while constantly developing creative quality and keeping costs low." (IKEA: The making of the IKEA Catalogue 2014, 2015).

Considering the realization as the third step of the option cycle process, improvement and development of IKEA's digital catalogue has been realized as a successful investment in digital options. Noticeably, the firm continues to further invest in these options by developing additional mobile application. The latest application is more comprehensive in terms of features and the amount of content. Thus, the combination of functionality and expansion of the amount of information gives consumers the opportunity to create a shopping list by using their "favourite button" in the digital IKEA catalogue, and then continuing to shop at IKEA website or physical store. Also, additional functions have been added to the mobile application, which allows consumers to share images from the catalogue to social media. As part of IKEA's Omni-channel strategy, IKEA's mobile application is distributed to three mobile platforms and available in App Stores namely; Google play, Windows phone and App store (Mortimer, 2014).

In line with the company's mobile strategy, the IKEA digital catalogue has a standardized base for the entire organization, which means that all the further development is on one standardized development platform. All IKEA retailers around the world have access to the IKEA's common platform. Moreover, realization and further development of this platform can also be geographically independent, i.e. can be customized depending on the local market and normally based on user feedback. For instance, IKEA Canada extends the shopping experience for customers by adding extra features in the original platform. Consequently, the distributor has re-designed version of the store's application which allows the customer to be able to check the inventory in their preferred physical stores (Samuely, 2015).

"Customers can view current offers and extended information for all our product - i.e. scan an item to find different colours, sizes, stock information, including location. " (Samuely, 2015).

The capabilities and resources developed by IKEA are summarized in the table below.

Option cycle	Resources	Capabilities
Identifying options	Inter IKEA Systems BV (O)	Maintain Know-How
	Market research (O&T)	Promote future investment
	Space 10 (O)	Create new ideas
	Yammer (T)	Exchange of knowledge

Developing options	Inter IKEA System (O)	Developing platform
	AR (T)	Improvement of mobile applications
	Multiple third-party actors (O)	Developing mobile applications
	Metaio (T)	
	Creative Hub (T)	
	CGSociety (T)	
Realizing options	User feedback (O)	User innovation to further developing Customized local product

Table 4: the capabilities and resources developed by IKEA

5.4 Electrolux

Since 2012, Electrolux has reformed its former innovation strategy, i.e. product centric approach, and shifting towards customer-centric approach. The reason for the reform of the original strategy was the new existing digital market and opportunities for creating innovative products through Omni-channel strategy. As mentioned, the latter strategy is based on customer experiences and user innovation, i.e. customer-centric approach, in which consumers can easily and quickly navigate their "decision journey" during e-commerce process. This means that the firms' currently ambition aims to continuously improve the market position by accelerating their product innovation and speed to market. To do that, the company aimed to extend its high-profitable product portfolio and strives to strengthen its services and aftermarket operations through various channels in the potential markets.

In line with the company's market grows strategies, Electrolux ambition was also to grow rapidly in the growth regions through customer - driven solutions, and to create innovative profitable products in order to minimize its manufacturing costs, increase sales and growth in the global premium segment (Telenor Connexion, 2014). Electrolux took various strategic initiatives - new/adjacent product categories, grow markets/new channels - to grow, and to improve its profitability. As result of these initiatives the company managed to expand globally into new markets. At the same time, strategic initiatives taken by the enterprises paved the way for innovation creation, and product developments. However, as it demonstrates in the figure below, the global expansion requires improvements of already existing products, e.g. ordinary home appliances, into the new products categories, and also creation of completely new products, e.g. connected appliances, through new marketing channels for strengthening the currently market position (see figure 4) (Electrolux: Profitable

growth, 2015).

“The focus is on increasing the share of sales in growth regions, strengthening the position in the group’s core markets and in the global premium segment, expanding in profitable high-growth product categories, developing service and aftermarket operations and reducing complexity and costs in manufacturing” (Electrolux: Profitable growth, 2015).

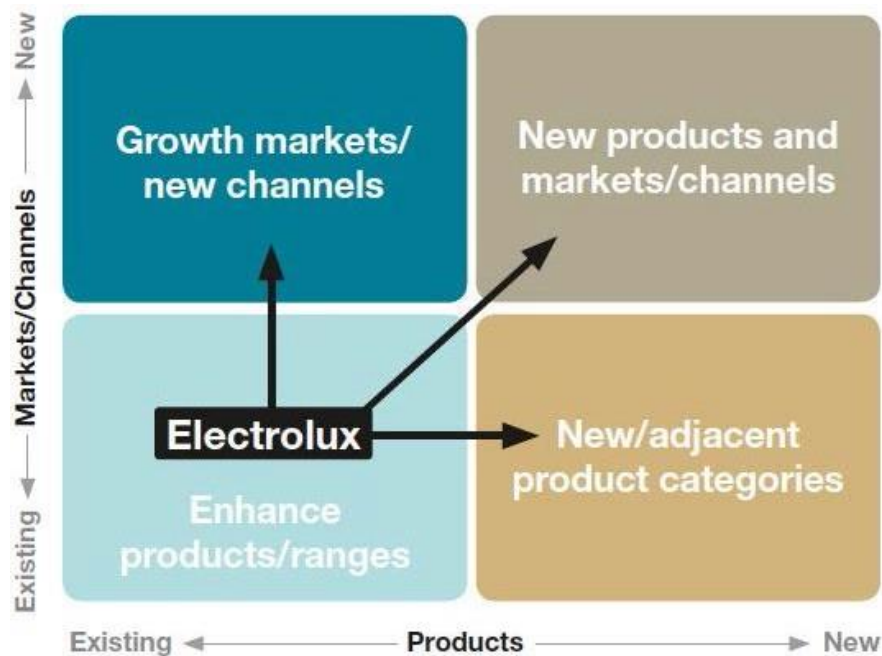


Figure 4: Electrolux profitable growth (Electrolux: Profitable growth, 2015)

As mentioned the Company’s former innovation strategy was originally a product-centric organization and the shopping experience had a supporting role. Eventually, when the smartphone usage and social media were ubiquitous in the daily life of consumers, Electrolux top management decided to change the strategy to cope with new market trends. In 2012, the company had to transform strategy into customer-centric. In line with the organizational transformation, the transition required the company to increase resources, and evolve the capabilities needed to implement the new innovation strategies by integrating, Electrolux's digital, trademark and brand. In simpler terms, in line with new store formats, in order to simplify the whole process of customer experience, the company strived for connecting new product types, and new online, social and mobile tools together. More particularly, products marketers aimed to create a cohesive experience from pre-purchase, the purchase itself, and to post purchase (Kopf and Geyer, 2014).

Consequently, in line with company’ efforts towards user innovation strategies, the company gathered a group of experts, i.e. "consumer experience teams", to eliminate the gap between business products and the digital world, such as marketing, sales, IT, consumer insight, and innovation. The team conducted a pilot innovation projects based on the consumer

experience, such as launching a new digital recipe-planning app. In every innovative pilot project, lead (managers) had a clear and decisive role. In each region a driven integrated customer experiences were built, based on customers' shopping experience in each market. Moreover, the organizational transformation was maintained through training initiatives, process improvements and new tools that all together focused on building a more consumer-focused culture. Subsequently, in 2013 the top global marketing leaders attended to trainings, focused on vision, strategy and plans with the aim to transform the company's appliance shopping experience. Finally, the transformation was implemented and has impacted growth positively by increased number of innovative products that meet customer needs (Kopf and Geyer, 2014).

"In the past six months, we've launched a branded food and home decor inspiration site, an online recipe site/app, a mobile augmented reality app to demonstrate the benefits of new products such as steam ovens and an in-store product-selector web site that helps consumers find the best washer and dryer for their needs. Our market research shows that shopper experiences are improving. Speed to market has accelerated." (Kopf and Geyer, 2014).

The former mentioned organizational changes have been challenging for the company but at the same time the company has achieved its objectives by shifting resources and pushing the corporate culture into new guidelines. Subsequently, the result of the project was so successful, that during only two years the company pulled ahead from behind in the Omni-channel race and surprised its competitors by overtaking a leader position in its sector (Kopf and Geyer, 2014).

In order to cope with the rapid market changes, firms need to invest for creating innovative products, which leads to sustainable competitive advantage and growth. To achieve this, they must first identify which investments are already made, in order to identify the options that have the market potential for further improvements.

Concerning the identification as the first step of the option cycle process that describes in section 3, Electrolux identifies investment options through constants observation of the market trends. One of the trends is Internet of Things (IoT) through which the company creates products, services and features that can enhance consumers' experiences which in turn will generate new user values. In addition, Curtis (2014) also claims that *"The Internet of Things is now becoming an important micro-trend and a game changer in the appliance business"* (Curtis, 2014).

Hereinafter in this section, the development and adaptation of IoT in Electrolux will be discussed. To invest on market trends is not a new topic for firms such as Electrolux. Since early 90s, the company has identified digital options and invested in various options for launching innovative products. As an example, Electrolux and Ericsson made a joint ventures agreement in terms of products and services for the intelligent homes, so called "E2Home". The result of the investment was not as expected, and rather unsuccessful. Firstly, the failure

was partly due to more connected appliances which required a more complete ecosystem. Secondly, the company identified the digital option were too early to invest for launching to the market. In other words, the market was not mature enough to introduce these digital options. Hence, consumers did not have enough knowledge and understanding of the handling of such digital Products (Telenor Connexion, 2014; Electrolux: Electrolux and Ericsson announce joint venture to market products and services for the Networked Home, 1999).

Electrolux's option thinking and option identifications has been a culture, meaning that management creates an environment for the staff and gives them the opportunity and space to come up with new opinions and ideas (Telenor Connexion, 2014; Electrolux: Innovation, 2015). It is worth mentioning that Electrolux is a global company with employees in distinct geography, time zones and culture. Therefore, a contemplated and joint interactive intranet throughout the enterprise is necessary for all employees and executives of the company.

Consequently, during recent years Electrolux has boosted its resources and capabilities to enable a comprehensive internal network that spans the entire enterprise. Electrolux uses IBM Connections, which is a platform for the implementation of a comprehensive and common communication system called e-gate that covers all departments of the company. Subsequently, with the aid of this intranet system, employees can gain opportunities to discuss their innovative ideas and views on product development, design, digital solutions and marketing. Partially, managers can initiate the discussions, give comment on employees' ideas and allow them to feel more involved in the idea creation process of innovative features or new products. (IBM: Electrolux Enables a Social, Mobile Workforce with IBM Software, 2012; IBM Connections@Electrolux, 2014; Lombardi, 2015). Furthermore, Electrolux hosts a global innovation challenge on the intranet in three days among employees around the world, called the iJam, in order to create new ideas for future investment. Moreover, the iJam event is a part of strategy aiming to increase the pace of innovation in the firm (Electrolux: Electrolux runs third innovation crowd sourcing event, 2015).

Moreover, in 2003, in line with identification of new ideas for investment, Electrolux established Design Lab as a global design competition in order to discover students that have potential ideas for future households. Also, the yearly competition has different theme every year, which decides by Electrolux company. For example, in 2014 the theme was called "Creating Healthy Homes", and, in 2015, the theme was named "Healthy Happy Kids". In this regard, Electrolux Design Lab functions as a resource for bringing in new ideas not perceived by themselves (Electrolux Design Lab: About, 2015).

Subsequently, these ideas aid the firm to improve digital product development. In this regard, Electrolux's R&D department states that, *"The Design Lab project puts us in a trajectory – encouraging us to think in different directions or look at different angles to those we would have thought of previously. My takeaway from Design Lab is that it is a thought-provoking challenge, which personally helps me to think in different directions"* (Electrolux Design Lab: Electrolux R&D, 2015).

Today, Electrolux allocate its resources on options based on facts coming from user surveys and focus groups based on practical cases where the products are applied in reality. Normally, the company manages product development jointly in three departments with a model called as, Innovation Triangle. According to this model, all three departments work and cooperate with each other for idea generation, innovation creation and new product development (see figure 5) (Telenor Connexion, 2014; Electrolux Design Lab: Innovation, 2015).

Subsequently, a close collaboration between the company's marketing, R & D and design functions driving consumer insight and market knowledge, which leads to launches of new products in line with the market changes and consumers' needs (Electrolux Design Lab: Innovation, 2015).



Figure 5: Electrolux Innovations triangle (Telenor Connexion, 2014)

The above-mentioned three departments follow a simple rule called "70 percent rule". This means that a new feature or a test product must be supported by at least 70 percent of the focus group in order to get the permission for further development (Electrolux Design Lab: Innovation, 2015; Telenor Connexion, 2014).

The marketing department is responsible for identification of options which is conducted systematically through customer surveys and analyzing the usage of a product type. The result of the previous step is handed over to the design department, which later give possible suggestions on various features to meet the customers' demand. Furthermore, in the next

step, the R & D department provides an assessment of the pros and cons of the different solutions. In the same section, the product or feature being tested anonymously in a focus group against the other leading products in the same price range. R & D is also tasked to look at new technologies and how they should be applied within the organization's world of products, services and consumables. In the last step, if 70 percent provide support to the option, which is already in the form of product or function, the product will go further into the production level, otherwise the product will be redesigned (Telenor Connexion, 2014; Electrolux Design Lab: R & D, 2015).

Considering the development as the second step of the option cycle process, Electrolux develops and adapts IoT in the company in order to cope with the rapid market changes. The company considers IoT as an enabler for creation of symbiotic relationship between IT and appliances in the future, in terms of smart home (Curtis, 2014). Therefore, in order to reduce the gap between IT and appliances, Electrolux has been member in Linux Foundations alliance with the intention of development a protocol for communication between connected appliances (Ibid).

The most commonly challenges with the introduction of IoT is standardization process which allows devices from different manufacturers to communicate with each other. The easiest way to handle this challenge is that firms together develop and use standardized operating systems. Electrolux's solution to overcome this barrier is to develop an open platform for IoT by joining the organization Allseen Alliance¹¹. This platform was from beginning an initiative by the Linux Foundation, and later by Microsoft as a member of the organization with a goal to contribute to development of IoT by creating a software framework.

Consequently, this contribution will aid discovering variety of devices, which can connect to each other for further communication. Microsoft's contribution to the open source platform is based on AllJoyn Device System Bridge (DSB) codes. DSB codes allow interoperability with legacy and purpose-built device networks. Furthermore, DSB technology has the ability to connect devices quickly and efficiently to the AllJoyn open source software framework (AllSeen Alliance: AllSeen Alliance's 'Superconnector' Bridges Legacy Devices with AllJoyn Applications for IoT, 2015; Åsblom, 2014).

The IT department at Electrolux is responsible for development of the alliances and also preparatory work for future plans, among other things, to connect more products and services to the platform. Furthermore, the IT department is also responsible for creating mobile applications for the online products, enabling end-users to communicate with the products (AllSeen Alliance: AllSeen Alliance's 'Superconnector' Bridges Legacy Devices with AllJoyn Applications for IoT, 2015; Åsblom, 2014). Electrolux already has a number of products connected to AllJoyn, an example is an offline steam oven that can be controlled with a mobile application developed in both Android and iOS (Åsblom, 2014).

¹¹ Allseen Alliance was formed in december 2013 and has developed the framework Alljoyn. The framework includes the common standardization for all members. The organization has over 70 members including Cisco, Microsoft, LG, Electrolux, Panasonic, Sony, HTC and Sharp.

The mobile application allows the end-user to, among hundreds of professional recipes existing in the application database, choose the most appropriate recipes based on parameters such as cost, ingredient, cooking techniques. During the cooking process, the application sends out related updates and warnings when it is necessary, which aids to achieve the expected result. Furthermore, the camera placed in the oven can take pictures of the food during the cooking process and shares them with friends through social channels. These features aim to make the whole cooking experience more joyful (IFA 2015 Preview: World's first connected steam oven with integrated camera lets you create delicious dishes through your mobile device, 2015).

Regarding the realization as the third step of the option cycle process, further improvement and development of connected appliances is an important part of the Group's strategy.

"Our ambition is to create products within an ecosystem that makes it simple, seamless and safe for consumers to connect their appliances, regardless of brand." (Electrolux: Electrolux launches first connected air-conditioner, 2015).

Hence, further development of the digital catalogue is done progressively. At the same time, the number of connected appliances that are controlled with the aid of mobile applications, are increasing Electrolux market range. The latest connected product is the smart air conditioners Frigidaire Cool Connect, which allows consumers to program the device via an application on their tablet or smartphone (Electrolux: Electrolux launches first connected air-conditioner, 2015).

"Over the next year we are going to launch a broad array of connected appliances in our core markets – the kitchen, the laundry room (with inventions like the Wi-Fi washing basket), and the home comfort area." (Curtis, 2014).

Products with connected features are first tested in a limited market. The reason is that users may use a beta version of digital services, which will later be developed based on user feedback on the products. Electrolux is working constantly to update the software and introduce new features for its services (Telenor Connexion, 2014). Furthermore, in order to make the Electrolux mobile applications accessible, and realize customers' usage of these services, Electrolux has developed a number of mobile applications, available on Google Play, App Store and Windows Phone. Thus, these platforms are connected to respective household appliances for monitoring, navigating appliances with the aid of mobile applications.

The capabilities and resources developed by Electrolux are summarized in the table below.

Option cycle	Resources	Capabilities
Identifying options	Consumer Experience Teams (O)	Retrieve market research
	E-gate (O)	Enable sharing digital solutions
	iJam (O)	Enable creation of new ideas
	Design Lab (O)	Promote new ideas
Developing options	Marketing (O)	Develop and improving product
	R&D (O)	
	Design (O)	
	Linux Foundations (O)	Promote interoperability
	Allseen Alliance (O)	
	AllJoyn (T)	
	IT department (O)	Providing and improving of mobile platform
Realizing options	User feedback (O)	Introduce new features
	App Store, Google Play, Windows Phone Store (O&T)	Making digital applications available

Table 5: the capabilities and resources developed by Electrolux

6. Analysis and Discussion

The chapter starts off with a short section on how digital technology influence the different case firms in this study. The final subsection illustrate how product developing firms creates dynamic capabilities to address digitalization in a series of steps inspired by the Option Cycle: identify digital market opportunity, developing digital market opportunity and realizing digital market opportunity. Firms capability development is discussed and interwoven with the theoretical framework and empirical findings below each step.

6.1 Influence of digital technology in case firms

The product developing firms in this study are all addressing digitalization and building capabilities, however the firm's use of digital technology to leverage business opportunities

differs. Assa Abloy, SKF and Electrolux are doing significant investment in resources and engage in capability development, to leverage the difference between current and future business direction. In product developing firms, the difference can be illustrated by the shift from optimization and incremental product innovation to digital innovation, which promotes radical innovation (Yoo et al 2009). The influence of innovation in a industry, permits for new practices to be created (Albert & Hayes 2003), and firms to capitalize on new income streams, i.e. opportunities or leveraging market needs. This can be illustrated by Assa Abloy, Electrolux and SKF, which are transforming their firms and developing capabilities to adopt or take the lead in the digital shift happening in their markets.

This thesis also shows that digital technology in SKF, is becoming an integral part of their business processes (Yoo et al 2012). This permits for the emergence of “smart” product developing firms, which empower both firms and their staff. To utilize and leverage digital technology, firms are investing in resources and capabilities, perceived as important in addressing digitalization for their industry. Not surprisingly, the empirical section show that the influence of digital technology differs depending on industry, as well as how technology is diffused and managed in the case firms. In IKEA, the impact of technology has not yet permeated the firm to the same extent as the other firms, part of this thesis. We argue, that the technology developed by the firm, improve and facilitate customers shopping experience, rather than being the main driver of creating new business by utilizing digital technology. However, effectively leveraging digital technology can be of substantial value for IKEA brick and mortar stores.

The reason for the argued cautious influence of digital technology in IKEA can relate to the firm’s market position. The firm has enjoyed a comfortable market position for a very long time with growth and expansions, putting pressure on competitors, if any instead of IKEA. It can therefore be argued that, lack of pressure and continued sales has simply not forced the firm, to invest in various technology that can be leveraged against competition and improved sales. The difference with the remaining case firms, also dominant players in their industry is that they have made significant investments in resources and capability development to stay ahead, in the digital economy.

6.2 Identify digital market opportunity

During this initial phase, firms are exploring digital pathways, to develop solutions that can gain market acceptance. The identification of digital options translates to capabilities that can aid firms in managing digitalization and acquiring digital technology, perceived to increase competitive advantage. In global markets with increased competition and emerging technology, transformation is not a choice, but a necessity. The power shift between the firm and the customer in the digital economy, places the customer in the driver seat. Knowledge of the customer is therefore vital. It can also be argued important to create a diversity of ideas for digital innovation, often not perceived by management, in order to satisfy the various needs in markets. Thus, the identification step is crucial. Hence, to strike on a digital market opportunity, it must first be recognized. Discovery of new digital technology corresponds

with capabilities for recognition and sense making of digital technology, i.e. making a careful inventory of current resources and firm actions (Bowman & Hurry 1993).

The firms in this thesis have focused their attention on capabilities that supports generation of new ideas on how to utilize technology to address digitalization, business opportunities and addressing customer needs. To illustrate capability development for this initial step, SKF and Assa Abloy are engaging in identifying, categorizing, and scrutinizing digital innovation to capture firm –and customer value. Specifically, capability development to generate new ideas thru innovation jams and leveraging innovation in the SKF case and Assa Abloy's innovation management and Product Management System which gives the firm capacity to leveraging innovation and integrating the customer of technology into the process. For example, Assa Abloy is integrating the customer into the innovation process by implementing a Voice of the customer program and capturing future trends from their Future Lab, which feed and promote ideas for technology.

All of the firms in the study are strengthening their innovation capabilities, in order to identify new market opportunities and products. Capabilities that can be salient in creating competitive advantage from innovation in digital technology is a structured way of leveraging -as well as promoting innovation within the firm. For example, in SKF, this particular capability lies on Connectivity Room. By leveraging innovation carefully more value can be given. For example, by making the distinction between invention and innovation, where the former can be interesting from a technical perspective whereas the latter infer a more holistic perspective where the technology is equally exciting and value adding to the firm, hence have a positive effect on competitive advantage.

Integrating the customer into the innovation process also corresponds to what SKF is doing with their innovation jams, i.e. taking ideas from employees as a seed for development of digital technology. Electrolux has invested in resources, to develop capabilities with the intention to increase firm flexibility, in coping with uncertainty and pace of change in the market. Similar to SKF, Electrolux uses iJam to create ideas for digital technology. The iJam event is a firm resource, increasing the pace of innovation, enabling new ideas, contributing to the firm's capabilities. By the firm's engagement in innovations jams, they can achieve a greater diversity in ideas for digital innovation. Further, the use of innovation sessions and innovation management function as one of several initial resources of ideas for digital innovation during development of new products or enriching physical products with digital properties, i.e. digital innovation (Svahn, 2014).

When new ideas are submitted from innovation jams, they are reviewed in terms of value and fit against current processes and match against strategy, i.e. they are aligned against resources and environment (Mata et al, 1995) Users and customers are brainstorming ideas and accentuate ways, technology can be used either for efficiency gains or competitive advantage using creativity and knowledge in their respective field. This particular capability connects the customer/user need and ideas for digital technology from start, thereby assuming a customer-centric perspective (Teece, 2010) when management is reviewing new capabilities

and future investments for digital technology. At the same time, categorization of digital innovation shed some light on the associated organizational and technical challenges, having structural impact on firm. Nevertheless, the use of innovation sessions put a great deal of trust in the participant's creative abilities on a specific occasion. This can jeopardize the creative core in the innovation process, thus the result of the process can be generation of less viable ideas, having an actual effect on competitive effect.

In connection with capturing innovative ideas for digital technology, Electrolux has established Design Lab, a global design competition as a mean to identify business ideas for future appliances. Design Lab consists of creative people who compete with each other to generate new ideas for new products. Products which in turn can infer a business opportunity and generation of new firm capabilities and knowledge and skills, of value considering the pace of change in the market, as is emphasized by Vassolo & Anand (2008). Design Lab produces the opportunity for Electrolux to design product features, attractive to markets, and creation of capabilities to manipulate existing skills and knowledge, which in turn results in competitiveness for the firm.

Thereafter, the new captured knowledge spreads throughout the entire firm by various channels. Electrolux shares the gained knowledge with all its employees by means of E-gate, Electrolux's internal communication tool, to allow every individual to positively affect the firm's performance level. This is in parallel with Kleinbaum and Stuart's (2014) description of intraorganizational social networks that affects the firm through creating coordination and extending adoptability. In SKF, the firm uses their department Connectivity Room as promoter and knowledge source in order to diffuse knowledge and digital technology. As product developing firms now shift from incremental product innovation to digital innovation, the capacity to address radical innovation becomes increasingly important, to seize new markets and gaining markets shares on existing markets by redefining a task or product in becoming more appealing to the market and customers. In addition, considering the previous legacy for product developing firms existing product architecture (Henderson & Clark 1990), new digital technology can have a significant impact on organizational structure and current processes.

In the same way, IKEA uses the Yammer global platform in order to maintain, encourage learning and share the gained knowledge. IKEA's social media staff tool, My IKEA Product Idea, and ICO Worker, are all based on Yammer. This permits the firm to become more flexible and have access to a broad range of potential ideas and innovative solutions which can facilitate the identification of viable digital technology, beneficiary for the firm. The usage of these digital platforms by IKEA co-workers impacts IKEA's ability towards developing capabilities, which influences competitive advantage. In other words, the integration between human resources and data can cause positive effects in terms of increasing of knowledge sharing. However, at the same time it can produce negative effects on the firms' competitiveness in terms of an exaggerated internal focus on the organization's capabilities and ambitions. This may distract the firm to maintain a holistic perspective on the competition on developing similar technologies, which needs to be considered (Drummond,

2014).

Speaking of gathering of information about market trends and customer related knowledge, Electrolux refers to Consumer Experience Teams in each region to conduct market research on consumer demands as a mean to improve products. By doing this the firm seek to eliminate the gap between current business products and digital products through gathering insights about consumers. Subsequently, this is in line with Tsai et al (2012) statement that, dynamic functions can be defined as an organization's ability to integrate, create and configure both internal and external competence to deal with changing environments.

With the same mindset, IKEA engage in capability development by using both internal and external competence to capturing knowledge about customer and competitors related knowledge in order to create opportunities for identifying potential business through collaboration between market research and their innovation laboratory, Space 10. The laboratory can be seen as a managerial strategy to enable flexibility, learning and innovation, where capabilities are created and recreated (second-order capabilities according to Schilke, 2014), and permits the viability of new features to be tested. The result of this laboratory leads to the creation of new knowledge that spreads throughout the organization as knowledge sharing and-accumulation by means of internal systems and specifically Inter IKEA Systems BV. The capabilities created from the above process gives IKEA the flexibility to create new future products, combined with the latest technologies to satisfy customer needs and expectations (Teece, 2014). Additionally, these capabilities help the firm to develop innovative products and thereafter develop market opportunities according to customer demands, generate new business models and increase capabilities in coping with rapid global changes. Subsequently, by market research and analysis, IKEA gains customer related knowledge which is about customer needs and in parallel Space 10 gains an overview about competitor related knowledge. A combination of these two finding, in turn, leads the firm to develop their already achieved dynamic capabilities (Chien & Tsai, 2012).

Therefore, the capacity of leveraging sense making of digital technology is important, during the initial step of proposed investments in digital technology and assuming a customer perspective can reduce events that influence poor investments, such as investing in technology not being a fit for the market or addressing actual customer needs. However, as digitalization influence customers, market and technology in different directions, investments in technology can become obsolete or stranded if adoption decreases or is scarce. Not only does this affect firm's from an economic perspective (e.g. expected pay-offs is limited, inferring a more narrow economic space for future investments) but also restrict future digital technology, due to path dependency (Fichman 2004). The latter, have a negative effect on competitive advantage and agility, which are important attributes for firms competing in markets permeated by digital technology (Sambamurthy et al, 2003). Consequently, viable capabilities for generating new ideas and agility are important, considering the rapid redefinition of industries that can takes place, when they are subjected to digitalization.

This has also been emphasized by researchers Abernathy & Clark (1985), stating that the

basis for competitive advantage lies in material resources, applicable knowledge and human skills and relationships. In fact, gaining new skills and knowledge can also lead to, according to Chien and Tsai (2012), development of dynamic capabilities, knowledge resources and learning mechanisms that increase the performance of the organization. Customer-related and competitor-related knowledge are resources that have a positive effect on capabilities. This is possible through understanding customers and competitors in line with adapting their capabilities to a changing environment, making integration of knowledge resources a necessary component.

Therefore, customer-related and competitor-related knowledge as resources should be maintained and constantly renewed for the creation of new capabilities. For instance, IKEA invests significant resources in the maintaining and dynamic fashion building the “IKEA know-how”, which is then shared with all IKEA’s franchises. In return, retailers share their knowledge and experiences with IKEA. This mutual collaboration helps in identifying the available options for adapting to the digital market. This relates to Di Stefano, Peteraf, and Verona’s (2014) view on the organizational theory where adoption to changes is emphasized, IKEA know-how serve as a tool to leverage change and learning which facilitates adoption.

Finally, all the above mentioned activities in developing capabilities to identify technology, which promotes management of uncertainty, in a rapid changing market. However, wise and creative leaders are influential in creating capabilities to identify, create, and manage change and improve business performance. An important factor according to Teece (2014), is the leaders’ openness to the staff and other stakeholders’ ideas and opinions regarding the potential market opportunities. Absence of openness or dictation of senior activities from the leaders’ side, according to Picone, Dagnino and Mina (2014), may break the dynamic capabilities or lead a project towards failure. Generally speaking, managing the firm’s resources can create the possibility for capabilities, in adapting firm’s resources with the external environmental conditions (Schilke, 2014).

Summary

Digital transformation imply, that product developing firms shift from physical to digital product development. To leverage this change, firms need to pay careful attention to customers and the development in markets. To utilize knowledge of customer and markets, firms are developing capabilities to integrate them in product development processes and the processes firms use, to generate new ideas for product development. At the same time, firms need to scan the market for new technology that on the one side can become an opportunity for the particular firm or pose a threat if competitors implement. Strong capabilities for leveraging innovation are also influential in this shift to develop product that exceed customer expectations, thus can become influential in digital markets. Developing digital products, infers new knowledge is being gained. This knowledge can thereafter be transformed to capabilities, important for firms operating in these markets. The transformation from knowledge to capabilities, put emphasis on knowledge accumulation and- sharing activities in order to leverage and exploit the knowledge fully as well as

diffusing it to the different layers of the firm. To develop products that leverage and meet customer -and market need, the utilization of customer -and competitor related knowledge is important. This knowledge can be gained by a mix of internal and external actors. These actors add value when firms are creating digital products, important to customer and influential in leveraging competitors in markets. Hence, successfully transforming from a physical to digital, product developing firm.

6.3 Developing digital market opportunity

Once, digital market opportunities are identified, firms engage in capability development to advance identified ideas for digital technology in order to strike upon the market opportunity, i.e. securing access to the digital market opportunity by investing in both resources and necessary skills (Bowman & Hurry 1993). During development of the SEOS technology, Assa Abloy used an integrated sustainability approach, meaning that the firm's existing locks has been considered and the technology has been adapted, for compability with a large portion of their installed base in their markets. This corresponds with architectural innovation (Henderson & Clark 1990), by using existing products and knowledge and creating new digital linkages between them. Similarly, SKF use their extensive industry knowledge, acquired during their many years of being in business. Building the digital platform by using knowledge gained on bearings effect on machine failure and converting it into a digital format, facilitate for the firm to capitalize on new income streams and subsequently gain access to new markets.

Digitally transforming an enterprise, and leveraging radical and disruptive innovation risks destroying the firm's existing capabilities and competence (Henderson & Clark 1990).

Furthering the discussion above on SKF's accumulated knowledge on their products and the industry (and respective markets), in parallel with investing in a digital platform, the firm was required to acquire new knowledge to leverage the digital domain. However, in contrast with Henderson and Clark (1990) argument, SKF's deep industry knowledge interplays with the cross-functional team in Connectivity Room, in order to promote digital innovation, i.e. enrich their physical products with digital properties (Svahn 2014). This permits SKF to benefit on existing capabilities, i.e. utilizing their proprietary industry knowledge to enhance their digital product offering. This indicates an interplay between ordinary and dynamic capabilities (Teece 2014). On an internal perspective, SKF decided to standardize on the iOS platform. As digitalization brings forward both challenges and uncertainty in pay-offs for investments in digital technology (Fichman 2004), it can be argued to important to maintain focus (Chesbrough & Garman, 2012). The firm is trying to leverage this by streamlining their resources to one platform internally. This entitles SKF to building one strong platform from where they can launch digital initiatives, rather than investing in disparate resources that risk fragmenting their digital journey.

SKF decided to build capabilities in-house to leverage digital technologies, by establishing a specific department responsible for managing their efforts in gaining value from digital innovation and technology. To extend their in-house capabilities, SKF has established a

solution partner network to increase capacity on developing digital solutions and acquire knowledge and competence in a more dynamic fashion. Considering the difficulty to generate new capabilities during changes in the market (Vassolo & Anand 2008) and acquire the technical skills required, to satisfy different market needs is equally difficult and time-consuming. By establishing a partner network, they are better prepared when a market opportunity arises and can act more quickly and shorten their development cycle, hence shorten time to market. Assa Abloy on the other hand, has built capacity in-house as well as utilizing open innovation to leverage digitalization by establishing partnership with Screen Interaction to develop the interface for their digital platform.

Similar to SKF, Assa Abloy has engaged in external partnership to gain access to industry knowledge important to exploit the value from digital technology. Hence, knowledge resources are integrated (Chien & Tsai 2012) in building capabilities to leverage the effects of digitalization. This is illustrated by their partnership with various actors in the hotel industry, in building a solution that meet and exceed the expectations from the market, hence innovate how hotel guest can utilize digital technology to simplify the experience of checking in and outs. Furthering their capabilities, the firm are making use of the large number of organizations, they have acquired throughout their years in business by establishing an internal partnership, i.e. between firms belonging to the Assa Abloy group. Altogether, a mix of capabilities and knowledge permits the group to operate in disparate markets. Thus, strengthen their brand and increase the range of their products. Hence, the knowledge inherent is pertinent, in building dynamic capabilities to develop digital technology that can be utilized in different markets, where they operate. Thus, the accumulated knowledge can increase the firm's competitive advantage. Drawing from the above, this illustrate how SKF and Assa Abloy, integrate and reconfigure internal and external competence in addressing changes in the market (Teece et al.1997; Barreto 2010; Tsai et al, 2012) when developing new products (Helfat et al 2007).

Likewise, IKEA creates capabilities through both internal and external competences in order to address changing environments. The firm strives towards finding, developing, renewing or combining potential resources or investment options in line with market changes, in order to utilize these resources in the most optimal way. In IKEA, incremental innovation of the digital catalogue application has been a result of combining the external - i.e. Metaio - as well as the internal resources- i.e. IKEA Communications AB - of the firm. By incrementally innovating the digital catalogue application, the firm can cope with digital market environments by being more flexible, in terms of information gathering through its service and providing an application, that are relevant to customers. Consequently, the capability facilitates utilization of resources in an optimal way, which in turn will aid IKEA to respond to future digital market changes. Generally, based on an economical reasoning, the digital catalogue services not only facilitate the purchasing process, but also, simplify the firm's information gathering and customization process, i.e. what customers need in different markets. Thus, more satisfied customers, leads to higher rate of purchases, as well as lower costs in terms of after sales services, logistics. As a result, the firm can gain from value by leveraging the information gathered by the application.

By developing their expanding network of Solution Factories, SKF has created the capability to both disperse their knowledge to the customers in exchange for profit and gain new knowledge from the various projects they complete. It becomes an iterative process of diffusion and infusion of new knowledge that facilitates organizational learning and promotes innovation, beneficiary for future projects where particular knowledge of digital innovation and technology can be utilized. By building the capability to leverage digital technology and learning by doing, the firm have created capabilities to ease the introduction of new technologies in their industry (Kahl 2014) As the network grows, the level of innovation can be increased as more knowledge is dispersed in the network and makes it more adept in delivering competitive business solutions to their customers. Further this builds capacity for the firm to act local and think globally as digital technology can be applied globally and then adapted for local requirements. This duality of information flow mediates positive effects in their endeavours in creating competitive digital solutions (Chien & Tsai 2012) that are innovating their customers' operations, hence creating SKF's competitive advantage by adding value for their customers.

With the same mindset, in order to provide value to customers, Electrolux takes the initiative to invest in digital technology on their products. Therefore, the firm invests on the adoption of the Internet of Things, and therefore is member in the Linux Foundation as part of a consumer-focused strategy to improve the firm's dominant position in terms of technology and market. Along with other companies, in line with the open innovation approach to exploit digitization, the Group uses Allseen alliance building standards that allows devices from different manufacturers to communicate with each other using the framework AllJoyn open source. In this way, it creates a growing network, where all members of the alliance can contribute more value to the network through the network effect (Kleinbaum & Stuart, 2014). The result of the network is the creation of capacity that permits the firm to create and disseminate knowledge by turning to innovation capabilities outside the firm's boundaries.

Further, another reason for becoming a member of this alliance is to provide customers with a broad spectra of products, developed and customized based on their needs, which will add more value to customers. According to Teece (2010), established companies need to develop a customer-centric perspective and new value propositions of products and services to create competitive advantages. An example of a customer-centric value creation, is IKEA's augmented reality (AR) function in the digital catalog app, which serves to enhance the shopping experience for customers. AR technology is becoming increasingly popular in retail as it permits customers to visually interact with products. By implementing the technology, the firm increases their value proposition rather than creates a new with digital technology. Similar, Electrolux's customer-centric perspective on the development of digital products in the context of cooperation in the Alliance, leads to the creation of capabilities such as promoting interoperability and common standards, which in turn creates opportunities to further develop and improve various devices and connectivity.

The digital transformation in industry where Assa Aboy's is operating has had a significant

effect, drawing from the fact that 50 % of their total sales originates from electromechanical locks. To capitalize on this income stream, the firm has engaged in building a platform for digital keys and complementary services. The firm has developed the platform to be readily available to different markets and use, expanding the firm's capabilities to leverage the platform in relation to different markets. This permits for the lock -and entrance firm to launch different areas of application from a single platform to a variety of established -and emerging markets, hence increasing a variance in income streams. Being an early adopter of a digital platform for issuing digital identities, creates a competitive advantage, drawing from that issuing digital identities is in high demand in the marketplace. Hence, being an attractive digital product feature in industry. The cry for innovative products, enforces the need for dynamic capabilities (Teece 2014).

The successful initiative to innovate the physical key to digital entails to a new and disparate ways of consuming the product (Yoo et al 2009) and permits for the firm to expand their product offering. This infers seeking to create competitive advantage in disparate digital market solutions, and moving away from optimizing and previously physical product offering, less beneficiary in markets influenced by digital technology (Teece 2007). Having a large installed base from start, certainly expedites matters in gaining competitive advantage from their new digital product offering. This extend the firm's capability in serving different markets with an attractive market offering, by utilizing their installed base and aligning with the markets cry for innovation.

Both SKF and Assa Abloy have invested in cloud-based infrastructures. With a cloud-centric infrastructure, the firms can expand product features further and distribute combined services. This permits for digital innovation, to increase competitive effects from digital technology (Abernathy & Clark 1985), by developing a complementary infrastructure (Teece, 1986), adapted for various digital products. Hence, the value from innovation can be increased. Assa Abloy and SKF illustrate this, by using flexible infrastructures to extend their digital product offering and services to a number of different users and markets. For example, SKF is extending their Data Collect application with a cloud service, that enables machine data to be reviewed by experts at SKF, thereby empowering their customers in more effectively leveraging their equipment as well as creating additional income streams for the firm. Similarly, Electrolux has established the Allseen Alliance as a large installed base, compatible for various internal and external appliances in order to increase dominance in the industry. Allseen Alliance is the resource and AllJoyn as the platform is the tool for promoting interoperability between appliances, which in turn, creates capabilities in terms of making it possible for future appliances to be connected to the already existing appliances, and to create mobile applications for enabling users to interact and monitoring products online.

Moreover, in Electrolux, the triangle of Marketing, R&D, and design, in itself, creates an opportunity for the creation of capabilities. The overall result is the ability to launch new products in line with changes in the market and consumers evolving needs, expectations, and interests. In accordance with what Teece (2014) states, the related departments are included in the typical dynamic capabilities that are necessary for the firm to carry out certain tasks. In

addition, the above mentioned departments perform activities that enable the firm to control its usual activities to a high peak, for example, the 70 percent rule, that governs building new features or a test product before the production process begins for either further development or re-design. The result of the identification phase and consumer research is the firm's orientation towards IoT, in the appliances industry. IoT can leverage the gap between appliances and digital technology, which in turn paves the way for creation of new products that can communicate with each other, or in simple words, digital convergence of products. Yoo et al., (2012) explain digital convergence as integration between digital technology and non-digital artefacts in order to promote innovations.

Summary

When firms have identified viable ideas for investment in digital technology, they need to strike upon the opportunity at hand by investing in and building appropriate capabilities. Digitalization pose a threat to firms, as the influence of digital technology in markets can destroy existing competence and capabilities. However, there are exceptions where firms are successful in building capabilities that creates digital linkage between and utilizes firms existing resources and competence. In addition, investment in new technology influence new knowledge and creates capabilities. Digital product development and management of technology is achieved by either building capabilities in-house or engaging in partnership with internal and external firms. Similar, to create innovative products, firms utilize a mix of innovation capabilities, from both internal and external actors. Digital products facilitate for capability development for increased diffusion, which permits firms to launch products on various markets. The property of malleability for digital products, extends firms capabilities to adaption to different application areas, and creating additional value. Digitization of products permits for products to connect network, and generate data. The data entitle to opportunities to improve products as a mean to increase value for customers. Similar, capabilities to create value added services is developed by utilizing the generated data from products.

6.4 Realizing digital market opportunities

The last step in the option cycle, which the authors synthesized into realizing digital market opportunities, aligns with the formation of the resources, that firms have invested in (Bowman & Hurry 1993), during realization of digital technology and addressing market opportunities. Assa Abloy is licensing, the SEOS technology to other solution developers (outside the Assa Abloy Group) as a way of increase the product distribution range. The strategic decision is mean to utilize the flexible infrastructure and digital products greater potential. This strategic move leverages both the advantage of being an early adopter of this technology and increases the number of adopters, by stimulating new linkage between the product and various application areas. The decision was recently taken, so the effects have yet to be gained by the firm. Nevertheless, it corresponds with creating network effects (Cusumano 2010) and making use of early adopters advantages, to increase adoption and growth (Gawer 2014) for the technology. The product is made available to other solution

developers by providing a SDK that can be utilized in combination with other firms' products. By subjecting the technology to SKF has chosen to provide their technology by using SaaS in order to make availability more convenient and flexible for customers.

Assa Abloy and SKF use cross-functional teams to leverage the complexity in decision-making when dealing with realization of investments in digital technology. Assa Abloy use a global council that consist of different competence in order to more effectively leverage the complexity inherent when investing in technology and managing digital innovation. Similar, SKF's Connectivity Room consist of various competences in order to realize products that align with firm strategy and correspond with market needs. In addition, placing Connectivity Room outside the normal organizational structure can facilitate faster decision-making and permits for a dynamic interplay with Group Management. This indicates that top management takes a responsibility, in the realization of digital products and moving towards emerging markets (Teece, 2014; Picone, Dagnino and Mina, 2014). By giving Connectivity Room's preferential access to group management by reporting directly to the CEO, rigidity in organizational routines (Henderson & Clark, 1990; Vassolo & Anand, 2008) such as inertia in decision-making can be reduced. In addition, this indicate the significance and value of digital technology and innovation to the firm. Hence, positioning of the department in the organizational structure, aligns with organizational and management innovation (Teece 2007).

However, Electrolux's ambition is to create products in a large ecosystem, which will be simple, seamless and secure way for consumers to connect their appliances digitally. The firm's purpose of investments in IoT serves to utilize economic effects of being part of a large network of connected devices. Yoo (2010), argue that digitalization of physical products can lead to the formation of a network where products can be consumed more easily, thus digital products can be considered as key in the digital economy. To gain a value in the digital economy, Electrolux is investing on significant resources as a mean to digitize their existing physical products. Equally important, according to Slywotzky and Morrison (2000), corporate capabilities play a large role in the value they create in the digital economy. Thus, it is important that Electrolux creates appropriate capabilities which in turn, creates more value. Further, the connected products are manufactured and improved based on consumer feedback, which in turn is based on a user experience perspective and a consumer-centric product development method.

Moreover, when Electrolux wants to release a new product or new set of features, it starts by testing a beta version in a limited market. Electrolux collects users' feedback from the beta version in order to improve the final release. Furthermore, the new features in turn, require new resources and creation of capabilities to be developed and realized in the market. In other words, the firm collects and analyses user feedback, to create products that are relevant to customers and have the potential to gain market acceptance. Regarding to the realization of digital products, Electrolux make mobile applications available to all connected products by distributing them in App stores. As part of the firm's Omni-channel approach Electrolux offers a wide variety of mobile applications Through App stores to increase adoption of

appliances and generate value for customers. A few of these applications are Electrolux AirCare by which users can control their air conditioners from wherever they are, or Let's Taste, where Electrolux offers step by step cooking guides for the effective usage of its steam oven.

Similarly, IKEA strives to leverage the feedback process from the customers, which can lead to product improvements in term of further development and to pave the way for firm's competitiveness. The product improvement in turn, requires both external and internal resources to create capabilities for fast market response in an appropriate time. As an example, based on IKEA's case study, the AR feature was a service created based on customers' demands. Utilizing user feedback increases the firm's ability to continuously develop existing products. As a result, the firm realizes the investments in terms of developing new products and can respond rapidly to the continuous market changes, and add value for its customers (Reuer and Tong, 2007), hence maintain competitive in their industry.

Summary

The diffusion of products is increased by building flexible digital infrastructures that permits for various products or adaption, hence increase the potential for products. The value of digital products can be increased by licensing it to other products. The benefits are increased distribution range and adoption of the technology, which is powerful in establishing dominant market technologies. To realize products, that meets customer -and market expectations, an important capability is to view products from different firm perspectives. This can be achieved by collaboration of various competence in the firm to manage the complexity in realizing digital products and technology. In order to realize products that gets the approval of market and customers, a pre version of the product can be released to a limited market. By collecting feedback from users, the viability of products and features permits to be verified.

7. Conclusion

The purpose of the final chapter is to answer the thesis research question: How are product-developing firms creating dynamic capabilities to address digitalization?

When technology underlying the foundation of firms are dynamically changed, corresponding changes in organizational functioning is required. Digitalization requires firms to adapt as it can destroy existing capabilities and knowledge. This thesis analysis show that product developing firms in different industries are building various dynamic capabilities in their effort to leverage digital transformation. Knowledge of the customer and market dynamics has been identified as important and firms are investing in and building capabilities that integrate the various interest of these stakeholders, close to the digital product development process. To gain market - and customer knowledge, firms create the capacity to utilize a mix of internal and external actors. To meet high expectations from the market regarding innovative digital products, firms are building innovation capabilities by means to maintain effectivity and speed in the innovation process. To realize products aligned with

customer and market expectations, firms are investing in innovation capabilities from both internal and external resources. Digital technology imply new knowledge is required. Knowledge is important for firms operating in digital markets and as result capabilities for external and internal knowledge sharing -and accumulation is influential. To further utilize digital products, firms are developing capabilities to create value added services from technology that uses flexible infrastructures promoting product variation and adaption. During realization of product, the capacity to view products from different perspectives with various skills, knowledge and competence is being built. Finally, the study has shown that case firms has adopted the real options approach to identify, develop and realize digital options, and generate dynamic capabilities and organizational and technological resources from above mentioned options. As a consequence, managerial flexibility is increased and permits for strategizing.

7.1 Suggestions for further research

This study is based on the literature review and our findings in four firms that are operating in different industries. A similar study could be interesting with more case studies in order to examine trends between industries and correlation with our finding. Moreover, further research in the area, within a specific firm or industry, is needed in order to investigate in detail to understand the processes through which dynamic capabilities are initiated and developed. Besides, the firms that we selected for our work are product-development firms, therefore, it may be interesting to observe how service-development firms such as software development, act with daily digital innovation projects in order to create dynamic capabilities, to manage the uncertainty and fast market changes. Additionally, another related research might be to investigate the possibilities to make a general framework for the development of dynamic capabilities within the investigated firms.

8. Limitations

The researcher's way of collecting data makes the nature of data less detailed, compared to data collected from interviews. Also, capabilities perceived having a competitive advantage are infrequently published online explicitly, hence difficult to discover with this particular way of collecting data. In compliance with the research question, the study has focused attention to product-developing firms and with a focus on external processes directed at the market and customer. The result from this study can for that reason not be used on other firms operating outside this domain. Further, the case firms all operate in different industries and markets. For that reason, the study is difficult to generalize to a specific industry.

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