Aalto University
School of Business

Robotic Process Automation of office work: benefits, challenges and capability development

A cross-sectional field study of five large Finnish corporations

Master's Thesis
Kristian Strömberg
Aalto University School of Business
Accounting
Spring 2018

Aalto University
School of Business

Aalto University, P.O. BOX 11000, 00076 AALTO
www.aalto.fi

Abstract of master's thesis

Author Kristian Strömberg

Title of thesis Robotic Process Automation of office work: benefits, challenges and capability development

Degree Master's degree

Degree programme Accounting

Thesis advisor(s) Jari Huikku

Year of approval 2018 **Number of pages** 93 **Language** English

Abstract

Robotic Process Automation (RPA) is a new technology for automating business processes mainly in the office environment. It is raising much interest currently in organizations as it enables fast automation of processes expanding over several IT systems in an unprecedented way. Processes such as those usually performed in accounting are typically fit for automation with RPA. As a result, company finance functions and centralized shared services organizations are among the early adopters of this technology. This thesis examines the benefits and challenges associated with RPA adoption in organizations. Furthermore, the objective is also to explain what resources and capabilities are required to take advantage of RPA and how these capabilities develop in organizations.

This thesis approaches the research questions through a qualitative cross-sectional field study. Data was gathered by way of interviews in five large corporations based in Finland. A total of 10 interviews were conducted with 13 professionals possessing expertise either from finance or robotics. Almost all of the interviewees were in a management position in their respective companies. The theoretical base of this study is drawn from the literature on business process management, as well as from the strategic management research stream on (dynamic) capabilities.

The findings suggest largely similar benefits and challenges of RPA adoption as those already suggested in the few earlier studies on RPA. However, this study deepens the analysis and discussion on the benefits and challenges providing insights into their interrelations. From a capabilities perspective, a contribution to earlier research is made by discussing the constructs of the dynamic capabilities framework in an empirical field study setting, grounding the framework more solidly in business practice.

Keywords Robotic Process Automation, dynamic capabilities, business process management

Aalto-yliopisto
Kauppakorkeakoulu

Aalto-yliopisto, PL 11000, 00076 AALTO
www.aalto.fi

Maisterintutkinnon tutkielman tiivistelmä

Tekijä Kristian Strömberg

Työn nimi Ohjelmistorobotiikka toimistotyössä: hyödyt, haasteet ja kyvykkyyden kehittäminen

Tutkinto Maisterin tutkinto

Koulutusohjelma Laskentatoimi

Työn ohjaaja(t) Jari Huikku

Hyväksymisvuosi 2018 **Sivumäärä** 93 **Kieli** Englanti

Tiivistelmä

Ohjelmistorobotiikka on uusi teknologia liiketoimintaprosessien automatisointiin toimistoympäristössä. Se herättää nykyisin paljon kiinnostusta organisaatioissa, koska se mahdollistaa nopean IT-järjestelmät ylittävien prosessien automatisoinnin ennennäkemättömällä tavalla. Laskentatoimen prosessit ovat tyypillisesti sopivia automatisoitavaksi ohjelmistorobotiikan avulla. Tästä johtuen yritysten talousfunktiot sekä keskitetyt palvelukeskukset ovat tämän teknologian ensimmäisiä hyödyntäjiä. Tämä tutkielma tutkii ohjelmistorobotiikan käytön hyötyjä ja haasteita organisaatioissa. Lisäksi tavoitteena on myös selittää mitä resursseja ja kyvykkyyksiä tarvitaan ohjelmistorobotiikan hyödyntämiseen sekä kuinka nämä kyvykkyydet kehittyvät organisaatioissa.

Tämä tutkielma lähestyy tutkimuskysymyksiään kvalitatiivisen poikittaisen kenttätutkimuksen keinoin. Aineisto kerättiin haastatteluilla viidessä suuressa suomalaisessa yrityksessä. Yhteensä 10 haastattelua toteutettiin 13:n talouden tai robotiikan alueiden ammattilaisen kanssa. Lähes kaikki haastateltavat työskentelivät yrityksissään johtotehtävissä. Tutkielman teoreettinen perusta koostuu liiketoimintaprosessien johtamisen kirjallisuudesta sekä strategisen johtamisen tutkimukseen kuuluvasta (dynaamisiin) kyvykkyyksiin liittyvästä kirjallisuudesta.

Tutkielman tulosten valossa hyödyt ja haasteet näyttäytyvät paljolti samoina mitä jo muutamat aiemmat ohjelmistorobotiikkaan liittyvät tutkimukset ovat havainneet. Kuitenkin tämä tutkielma syventää analyysiä ja keskustelua hyödyistä ja haasteista tarjoten näkemyksiä niiden välisiin yhteyksiin. Kyvykkyyksien näkökulmasta kontribuutio aiempaan tutkimukseen tehdään keskustelemalla dynaamisten kyvykkyyksien viitekehyksen käsitteistä empiirisessä kenttätutkimusympäristössä ja näin vahvistaen viitekehyksen yhteyttä liiketoiminnan käytäntöihin.

Avainsanat ohjelmistorobotiikka, dynaamiset kyvykkyydet, liiketoimintaprosessien johtaminen

Table of Contents

List of Tables

1 Introduction

> *"We are being afflicted with a new disease of which some readers may not yet have heard the name, but of which they will hear a great deal in the years to come – namely, technological unemployment. This means unemployment due to our discovery of means of economising the use of labour outrunning the pace at which we can find new uses for labour."*
>
> *– John Maynard Keynes, 1930 (Keynes, 1930, p. 37)*

At the dawn of the fourth industrial revolution, the words of Keynes are becoming topical. Keynes was forecasting 100 years into the future. This would be year 2030, not very far away anymore. The quickly evolving capabilities of automation and artificial intelligence have the potential to perform in domains earlier belonging to humans only. Financial services group Citi has estimated that between the years 2015-2025 there could be a 30% reduction in banking jobs with automation of retail banking being the main driver (Citi, 2016).

In their widely publicized study *The future of employment: How susceptible are jobs to computerization*, Frey and Osborne (2017) estimate that around 47% of total US employment is at high risk of being automated in the next decade or two with the occupations of accountants and auditors receiving the high probability for computerization of 0.98 (1 = 'computerizable'). Furthermore, Kokina and Davenport (2017) also find that auditing is fertile ground for automation and the Big Four accounting firms are investing heavily in artificial intelligence and analytics.

In the automation of office work, a new technology has fairly recently entered the scene, namely, Robotic Process Automation (RPA). RPA works on top of existing IT systems logging in and out of systems and performing tasks just as a human would. It does not interfere with the underlying systems architecture and is, as such, relatively simple to implement. (Lacity and Willcocks, 2016a) The technology is not cognitive and so it can only perform strictly rules-based tasks. Hence, it does not (yet) possess capabilities like some more intelligent tools. However, considering the wide array of tasks within office work which do not require much in the way of cognitive effort, one can see that this tool by itself can amount to quite a lot even if lacking cognition.

1.1 Motivation and research gap

Despite being aggressively touted as a new transformation lever for businesses by the big consultancies like Accenture, The Boston Consulting Group and Deloitte (to name just a few), academic research on RPA has thus far been nearly non-existent with papers being published mainly in business journals (see e.g. Lacity and Willcocks, 2016b; Hallikainen et al., 2018). It seems that academia has not yet caught up to understand the possible implications of this technology. The accounting research community would do well to start the process of understanding what the implications of RPA are on accountancy. Research like inquiries into the role and necessary skills of the accountant as well as research on management control systems may gain new perspectives as a result of new technologies like RPA and artificial intelligence introduced into the research environment.

Partly because of the still limited existing research on RPA, the study at hand addresses some basic issues in RPA adoption and attempts at providing also more practical findings. It will aim to understand the benefits and challenges of RPA adoption as well as the resources, capabilities and their development in organizations currently. To this end, a cross-sectional field study is conducted in five large Finnish corporations.

This study will draw its theoretical lens from the research related to business process automation consisting here of business process redesign, business process management and the limited existing papers on RPA. Process automation has been a goal of businesses since the industrial revolution. The focus of automation has with time transferred from the factory floor to the office environment and business processes. What modern business process redesign and management theories add to Taylor's scientific management is a certain cross-functionality more focused on the customer. (Lindsay et al., 2003) Both business process redesign (e.g. Davenport and Short, 1990) as well as business process management (e.g. vom Brocke et al., 2014) recognize the importance of technology in supporting and developing business processes. RPA is one such, emergent, technology offering new possibilities in managing business processes.

A second stream of research supporting this study is that related to capabilities and their development and, especially, dynamic capabilities. The dynamic capabilities framework was born as an extension to the resource-based view of the firm in the 1990s to further explain how firms gain competitive advantage by altering their resource base (Ambrosini and Bowman, 2009). Notable work on the framework has been produced especially by

Teece (e.g. Teece et al., 1997 and Teece, 2007, 2012 and 2014) and also Eisenhardt and Martin (2000).

Research on (dynamic) capabilities has been abundant in the past almost three decades (see e.g. Ambrosini and Bowman, 2009; Barreto, 2010; Di Stefano et al., 2014). However, given the high proportion of studies published, empirical research has been fairly scarce (Ridder et al., 2009) with a lot of attention devoted to discussing the central constructs themselves (e.g. Eisenhardt and Martin, 2000; Makadok, 2001; Sirmon et al., 2007; Ambrosini and Bowman, 2009; Helfat and Winter, 2011; Pavlou and El Sawy, 2011). Ambrosini and Bowman (2009) worry, that the dynamic capabilities framework is constrained in its utility because of limited empirical study along with the difficulty of giving practical recommendations. In the same vein, Collis (1994, p. 151) suggests, that instead of proclaiming the value of capabilities, researchers "should generate lists of the enormous variety of capabilities and develop normative prescriptions for actually building those capabilities that have apparent potential". This study aims to answer these calls by taking the dynamic capabilities framework into an empirical field study setting to understand how firms build capabilities for RPA. To ground the study further in business practice, a subsection will also be devoted to discussing managerial implications.

1.2 Research objectives

The objective of this study is to examine the benefits and challenges associated with RPA adoption in organizations. Furthermore, the objective is also to explain what resources and capabilities are required to take advantage of RPA and how these capabilities develop in organizations. Additionally, RPA as a tool and capability will be positioned in the broader context of a dynamic business process management capability to assist managers in how to conceptualize the role of RPA in the greater scheme of company strategy. The study yielded also some findings on the impact of RPA technology on the company finance function which will be discussed briefly, adding some further relevance from an accounting research standpoint. Concluding from the above, the specific research questions are formulated as follows:

1. *What are the expected benefits and challenges of RPA adoption in organizations?*
2. *What does an RPA capability consist of and how is it developed?*

The first question aids in developing basic knowledge of an emerging technology by asking the simple question of benefits and challenges. From a managerial perspective, these are fundamental questions any business would be asking itself when scoping out the opportunities of a new technology.

The second question attempts to answer how an RPA capability is built and what the specific building blocks are. Constructs from the dynamic capabilities framework are used here for support and to invoke theoretical discussion. The answers to this second question also provide normative prescriptions, thus extending on the implications offered for the manager in answering the first question.

Discussion on capabilities in the strategic management literature has been revolving on a high level of abstraction with relatively few attempts to bring it closer to business practice. Possibly as a result of this abstraction, academics have built research paper upon research paper of their own constructs, definitions and their interrelations. This study attempts to use the different constructs in an empirical field study setting and hopes to succeed in giving some examples of how theory ties in with practice.

1.3 Structure of the study

The remainder of the study is structured as follows. Next, sections 2 and 3 will present the relevant literature providing a theoretical foundation for the study. Section 2 acquaints the reader with business process automation in general as well as RPA. The section provides especially a theoretical foundation for research question 1. Section 3 introduces theory on capabilities and in this way works as a basis of theory through which to approach research question 2. The section will finish off by summarizing the relevant findings from the literature for the purposes of this study.

Section 4 outlines and justifies the chosen cross-sectional field study method and, also, introduces shortly the companies constituting the field in this study. In addition, the section explains how data was gathered and analyzed as well as discusses the validity, reliability and generalizability of the study findings.

Section 5 covers the actual field study findings and provides some analysis of those findings. The section starts with describing the status of RPA adoption at the companies and several use cases are provided to inform the reader of the possible application areas of

the technology. Following this, separate subsections have been dedicated for findings on RPA from a business process management perspective, benefits, challenges and capability development.

Section 6 discusses the findings from the previous section in light of the theory presented in the literature review. This section is divided in two parts following the two research questions.

Section 7 concludes the study by summarizing the main findings. As the study aims to also be firmly grounded in practice, some implications for managers will be presented. Finally, discovered opportunities for further research are suggested.

2 Business Process Automation

Process automation has been a goal of businesses since the industrial revolution and Taylor's principles of scientific management. As Lindsay et al. (2003, p. 1016) put it:

> *"A production process was seen as a linear progression taking raw material and transforming it into a finished product. Activities were studied, broken down, standardized and those activities conducive to automation were transferred to machine production. Activities too complicated or variable remained in the hands of the human operators."*

Later on, the focus of process automation has shifted to office environments (Lindsay et al., 2003).

2.1 Business Process Redesign

In the beginning of the 1990s, the concept of Business Process Redesign, or Reengineering (BPR), emerged along with the advent of modern information technology (IT) (see e.g. Davenport and Short, 1990; Teng et al., 1994; Grover and Malhotra, 1997; Kettinger et al., 1997). BPR was seen as an important tool in improving e.g. service levels, efficiency and performance overall in a globalizing and increasingly competitive world (e.g. Grover and Malhotra, 1997; O'Neill and Sohal, 1999).

Davenport and Short (1990) note how, despite significant investment by US companies in IT, office work was not gaining improvements in productivity. The reason for this was seen in suboptimally designed processes where cross-functional processes were optimized only within specific functions and not across the entire process. BPR was proposed as the remedy by introducing complete redesign of business processes to make better use of the potential of IT. (Davenport and Short, 1990)

Davenport and Short (1990) differentiate business processes from manufacturing processes with the former being "a set of logically related tasks performed to achieve a defined business outcome". Armistead and Machin (1997) emphasize cross-functionality by defining that business processes are a "series of interrelated activities, crossing functional boundaries with inputs and outputs". The role of IT in this should not be viewed as only a tool for automation, but as a more fundamental element for transforming business operations. The supporting role of IT should be moved away from a functional way of thinking towards a processual view. Processes can be seen as possessing two specific

characteristics: they have customers (internal or external to the organization) and they cross organizational boundaries (i.e. they are not limited by the formal hierarchies of the firm). (Davenport and Short, 1990)

Davenport and Short (1990) defined five steps for BPR, these are: developing the business vision and process objectives, identification of processes for BPR, understanding and measuring existing processes, identification of IT levers and designing and building a process prototype. What follows is a brief overview on the details of these steps.

Developing the business vision and process objectives. Developing a vision means having a strategic vision which the redesign efforts support. BPR is not about rationalizing processes, so the efforts need to be put in context of a broader strategic vision like, for example, aiming for more focus on the customer. To reach the vision, some goals in the form of process objectives are needed for some added specificity. Common objectives are cost reduction, time reduction, output quality and, also, the quality of worklife, learning and empowerment. (Davenport and Short, 1990)

Identification of processes for BPR. Identification of processes can be challenging for managers as their responsibilities usually do not stretch over processes, but are contained within functions. There are two main approaches for identifying processes: the *exhaustive approach* involves mapping all of the existing processes and prioritizing them for redesign and the *high-impact approach* attempts to identify only the processes which have the most impact on reaching the business vision and objectives. The high-impact approach is often sufficient as the exhaustive approach requires abundant resources and in the end cannot guarantee superior results. (Davenport and Short, 1990)

Understanding and measuring existing processes. This step involves understanding the problems inherent in the current process as well as measuring the process to set a baseline for comparing future improvements. The measurements should be aligned with the process objectives set in the earlier phase to avoid unnecessary measurement. (Davenport and Short, 1990)

Identification of IT levers. The available IT capabilities are to be identified as they may have great impact on the redesigned process. The point to recognize here is that IT is not only a supporting tool for the new process, but can enhance and improve the whole process. (Davenport and Short, 1990)

Designing and building a process prototype. The initial version of the redesigned process is merely a prototype which should then be improved further in an iterative manner. (Davenport and Short, 1990)

2.2 Business Process Management

The stance of BPR to business processes of "obliterating" processes to then re-engineer them (Hammer, 1990) required radical change in processes which often was not realistic for organizations to implement in practice. BPR often did not offer the expected benefits and was sometimes claimed to be just a fad. The business process view was, however, still seen as valuable to focus on. Business Process Management (BPM) then emerged to offer a more holistic approach to managing business processes. BPM is a continuation to the research streams on BPR and Total Quality Management (TQM) which is more centered on continuous, gradual improvement instead of the radical type of BPR. BPR and TQM as well as other process development schemes can be seen as falling under the umbrella of BPM. (Hammer; 1990; Armistead and Machin, 1997; Zairi; 1997; Lee and Dale, 1998; Pritchard and Armistead, 1999; Hammer, 2001; Hung, 2006; Smart et al., 2009; Niehaves et al., 2014)

Weske et al. (2004) define BPM as "supporting business processes using methods, techniques, and software to design, enact, control, and analyze operational processes involving humans, organizations, applications, documents and other sources of information". They add that in their view BPM is concerned only with explicit operational processes ruling out strategic processes and those processes which are not clearly visible. Also, their definition of BPM requires that the related software need to be aware of the processes they are part of. (Weske et al., 2004)

BPM differs from BPR e.g. in the way that BPM is interested in the continuous management of processes (Armistead and Machin, 1997; Zairi, 1997). BPM is concerned with processes ranging from manufacturing to marketing to more supporting functions with an emphasis on the main operations where the potential to add business value is largest (Zairi, 1997). Lee and Dale (1998) synthesize earlier definitions suggesting that common for them is that BPM is structured, analytical, cross-functional and focuses on continuous process improvement. The software supporting process management has become to be known as Business Process Management Systems (BPMS) (Ko et al., 2009).

Weske et al. (2004) define BPMS as "a generic software system that is driven by explicit process designs to enact and manage operational business processes".

According to Ko et al. (2009), BPM is a relatively practical subject, drawing from several fields like organization management, computer science, mathematics, linguistics and philosophy, making it cross-disciplinary. The abundance of research around BPM started to lead to some confusion in the late 1990s as theory, standards and systems were frequently getting mixed up. In addition to BPR, also workflow management is sometimes confused to be synonymous with BPM. However, workflow management is more a specific technology and, thus, a subset of BPM and BPMS. To add to the confusion, some BPMS are actually synonymous to simple workflow management systems as software vendors may have an interest in coining their workflow management systems to resemble the more popular BPM. (Ko et al., 2009)

Based on focus groups consisting of members from academia as well as experts from business, vom Brocke et al. (2014) formulate ten principles representing good BPM practice (listed below in Table 1). Each principle is assigned a description of its positive manifestation as well as its antonym representing undesirable practice. The principles are meant to provide more concrete guidance to practitioners and highlight potential research directions for academics in the somewhat fragmented field of BPM.

No.	Principle	Description of positive manifestation (+) and antonym (−)
1.	Principle of context-awareness	+ BPM should fit to the organizational context − It should not follow a cookbook approach
2.	Principle of continuity	+ BPM should be a permanent practice − It should not be a one-off project
3.	Principle of enablement	+ BPM should develop capabilities − It should not be limited to firefighting
4.	Principle of holism	+ BPM should be inclusive in scope − It should not have an isolated focus
5.	Principle of institutionalization	+ BPM should be embedded in the organizational structure − It should not be an ad-hoc responsibility
6.	Principle of involvement	+ BPM should integrate all stakeholder groups − It should not neglect employee participation
7.	Principle of joint understanding	+ BPM should create shared meaning − It should not be the language of experts
8.	Principle of purpose	+ BPM should contribute to strategic value creation − It should not be done for the sake of doing it
9.	Principle of simplicity	+ BPM should be economical − It should not be over-engineered
10.	Principle of technology appropriation	+ BPM should make opportune use of technology − It should not consider technology management as an after-thought

Table 1. Ten principles of good BPM (vom Brocke et al., 2014)

2.3 BPM capability development

Maturity models are a popular approach in BPM research to support the evaluation and development of BPM capabilities (Röglinger et al., 2012; Niehaves et al., 2014). Maturity models aim at recognizing the stages of maturation (Röglinger et al., 2012). They are descriptive (in assessing the current state) and prescriptive (in identification of future paths) (ibid).

Maturity models tend to describe the progress of BPM maturity from a low maturity characterized by ad hoc processes and "firefighting" and resting on only a few individuals to a very mature organization where BPM is broadly embedded in the organization's operations and strategy, efficient end-to-end processes exist and employees understand the processes and their own part in them (Röglinger et al., 2012). In their review of existing BPM maturity models, Röglinger et al. (2012) summarize that maturity models are generally adequate for descriptive purposes, but are lacking in their prescriptive qualities meaning that those resorting to maturity models in forward-looking capability development may not gain much from them.

In the same vein, Niehaves et al. (2014) criticize the linear life-cycle approach to BPM capability development as suggested by maturity models. Instead, they introduce a dynamic capabilities contingency view to BPM capability development (ibid). Based on their case study, Niehaves et al. (2014) propose that following a linear maturity model based capability development path doesn't account for environmental factors and may, as such, lead organizations astray. A contingency approach accounts for the fact that all organizations do not necessarily need the same level of sophistication out of their BPM. As a result, e.g. unnecessary capability development can be avoided. (Niehaves et al, 2014)

Trkman (2010) also combines dynamic capabilities and contingency theory, but includes task-technology fit in identification of critical success factors of BPM. According to task-technology fit theory, IT use should always match with the tasks it is supposed to support. This means that the choice of IT systems should be contingent upon the business processes which are supposed to be automated. (Trkman, 2010)

2.4 Robotic Process Automation

RPA is an emerging technology for business process automation which is only lately sparking wide-spread interest in businesses. These robots have also been called software bots (Suri et al., 2017), which is fitting as what is called a "robot" typically means one software license for RPA software (Lacity and Willcocks, 2016a). The Institute for Robotic Process Automation & Artificial Intelligence defines RPA as follows: "Robotic process automation (RPA) is the application of technology that allows employees in a company to configure computer software or a 'robot' to capture and interpret existing applications for processing a transaction, manipulating data, triggering responses and communicating with other digital systems" (IRPA AI, 2018). Important to note in this definition is that by "employees" it does not refer specifically to personnel in the IT function, but to any employee who happens to have the required combination of process knowledge and sufficient, fairly basic, IT skills to configure the software to complete the process in question. Among the most prominent RPA software vendors are Blue Prism, Automation Anywhere, IPsoft and UiPath (Lacity and Willcocks, 2016a).

Essentially, RPA is applicable to what are called "swivel chair" processes where employees sit at their desks completing tasks in different IT systems and tools (Lacity and Willcocks, 2016a). The RPA software completes tasks just as a human would by logging in and out of systems with its own user IDs and passwords through the presentation layer of the systems and without involvement with the system's underlying logic (Lacity and Willcocks, 2016a).

Automating processes does not necessarily require knowledge of programming as the RPA software is in many cases taught the process by simply dragging and dropping icons which represent phases in the process. As a result RPA has been called "lightweight IT" as it doesn't require heavy involvement from the IT department for configuration and in this way operates on top of other systems. These features of easy configuration and lightness (in terms of operating on top of systems through the presentation layer only) distinguish RPA from BPMS which requires that programming is done by skilled software developers in the deeper business logic and data access layers of systems. (Lacity and Willcocks, 2016a)

RPA software is relatively affordable and does not require as heavy IT investments because of the need for less IT support and configuration. This improves the business case

for RPA and is one reason for the increasing interest of businesses. The point is not, however, for RPA to substitute BPMS, but rather to complement it to enable process automation in areas where BPMS is too heavy or expensive to implement. RPA use can also be scaled up relatively quickly by having enough licenses available to respond to greater demand at peak times. (Lacity and Willcocks, 2016a)

As the topic of cognitive technologies has received a lot of attention in media and business as of late and the rise of artificial intelligence is raising expectations in every industry, it is useful to consider where RPA fits in this picture. Davenport and Kirby (2016) categorize cognitive technologies into four groups based on the level of intelligence that they offer. These groups are, from least to most intelligent: support for humans; repetitive task automation; context awareness and learning; and self-awareness. Here, RPA belongs to the second group of repetitive task automation. To enable repetitive task automation in digital environments, two criteria must be fulfilled: the decision logic needs to be rules-based and technologies are needed for moving tasks through a workflow to complete a process. (Davenport and Kirby, 2016) Lacity and Willcocks (2016b) outline three criteria to be fulfilled to enable robotic process automation: structured data, rules-based processes and deterministic output (i.e. the process must produce a single correct outcome). The requirement for deterministic outcomes is a reflection of the fact that RPA does not possess cognitive capabilities which could then enable several different, probabilistic, outcomes to be produced (ibid). These types of capabilities would mean a more intelligent system and a step in the direction of artificial intelligence.

2.4.1 Application areas

RPA is sparking interest in organizations particularly because of its wide range of use cases. It is not limited by functional or business boundaries, but is a multipurpose tool for automating all kinds of rules-based processes in the digital sphere. Opportunities for RPA can be found in the back-office as well as in front-office processes. (E.g. Davenport and Kirby, 2016; Lacity and Willcocks, 2016a)

One area where RPA's potential has been emphasized is Shared Services organizations or so-called Shared Service Centers (SSC) where large companies often centralize their business support functions such as finance, HR, IT and other back-office tasks or even parts of their front-office customer service processes. SSC processes are typically by their

nature recurring, standardized and rules-based processes making them fit for automation. Transaction volumes in SSC processes are often high which improves the business case for automation. Often large corporations have already engaged in Business Process Outsourcing (BPO) and offshored their SSC to benefit from labor arbitrage. This in itself signals that the processes in question may include low-skill tasks which could also be automated given the right technology. (Lacity and Willcocks, 2016a; Suri et al., 2017)

BPO providers have lately also reacted to the need to build their own RPA capabilities as the technology obviously threatens their business model of benefitting from labor arbitrage. This brings an additional dimension to the decision where exactly organizations should locate their RPA capability as the automation can be outsourced to a BPO provider. There are also new types of outsourcing providers offering specifically RPA as a service. One option is naturally to buy software licenses directly from a RPA software vendor and building the capability in-house with internal resources or alternatively with the help of external consultants. (Lacity and Willcocks, 2016b)

2.4.2 Benefits

An obvious benefit of RPA which managers tend to identify early on is the reduction in employees required for the automated tasks. Savings from so-called full-time equivalent (FTE) employee reductions are among the most appreciated benefits of RPA. These reductions may be directly realized as savings in operating expenses, or alternatively, as human resources are freed from automated tasks, they can be redeployed to more value-adding tasks. (Lacity and Willcocks, 2016a; Suri et al., 2017)

Improved speed and quality are other benefits often identified as arising from RPA implementation. In other words, robots do not make human errors. RPA software completes the tasks exactly as it has been taught and often faster than humans. As use of RPA requires process standardization the unnecessary steps which humans might take are often eliminated. Software can run completing tasks around the clock and seven days a week. (Lacity and Willcocks, 2016a; Suri et al., 2017)

In their survey among Shared Services leaders, Suri et al. (2017) found that also improved customer service and satisfaction were perceived as benefits of RPA. Lacity and Willcocks (2016b) give an example that this benefit could manifest itself as e.g. customer agents solving client problems rapidly by having RPA mine data to support solving of the

customer's problem. Also in the case study by Lacity and Willcocks (2016a) there is indication that customer service can improve by implementing RPA as turnaround times to customers can be shortened with RPA offering efficiency and removing some of the bottlenecks in processes.

Another, though less frequently identified, benefit arising from the survey by Suri et al. (2017) is the increased wellbeing of employees as their time is freed up from the less rewarding tasks. Lacity and Willcocks (2016b) had similar findings. This benefit is naturally dependent on an existence of more value-adding tasks to move employees into and it also requires that the personnel have sufficient competence in the new tasks which are assigned to them.

The scalability of software bots can also be considered a benefit to be accounted for. RPA induces flexibility to processes as its use can be scaled up and down based on demand. (Lacity and Willcocks, 2016a; Suri et al.; 2017) In order to be able to scale up faster, Lacity and Willcocks (2016b) suggest setting up a centralized command center with the aim of driving reuse of the robots. Having a library of previously programmed scripts ready as a base for building future robots is the economical approach for scaling with changing process volumes (ibid).

Furthermore, some identify improved auditing of transactions as a benefit in the Suri et al (2017) survey. The findings by Lacity and Willcocks (2016a) support this. RPA software logs all of its actions and so an audit trail is always created for its operations (Lacity and Willcocks, 2016a).

Suri et al. (2017) offer the following findings (listed in order of significance) from their global survey of RPA benefits in Shared Services organizations:

1. Increased speed of operations
2. Utilization of FTEs on more value-added activities
3. Elimination of errors
4. Reduction in FTEs
5. Increased customer satisfaction
6. Improved customer service
7. Increased quality
8. Increased agility to handle more work during peak periods
9. Improved agility
10. Wellbeing of operators as they are offloaded of non-rewarding tasks
11. Improved capacity management
12. Better auditing of all transactions
13. Reduced fraud

In summary, the benefits in the to date scarce literature are largely self-evident. Speed, quality and savings are understandably important drivers of process automation. Maybe more surprising are the possible benefits on employee satisfaction. Looking a bit further ahead, it does make sense that once employees become accustomed to RPA and the potential it offers in automating mundane tasks, also satisfaction and engagement rise. However, this is a double-edged sword as automation has also the potential to eradicate some jobs which will be touched on in the following on potential challenges of RPA adoption.

2.4.3 Challenges

RPA hits home very close to the concrete day-to-day activities of employees. It operates as the employee would in the IT systems completing tasks, but exceeding the capabilities of humans in some areas making it possibly a frightening competitor to human workers. Also the survey findings of Suri et al. (2017) provide evidence that there is a belief at companies that a fear of job loss can prove to be a challenge for RPA implementation. Hallikainen et al. (2018), in their case study of Finnish BPO provider OpusCapita, arrived at similar findings.

Lacity and Willcocks (2016b) suggest it is important for companies to recognize this fear in order to alleviate it. In their studies, they found that actually RPA mostly affected certain tasks within jobs rather than the jobs entirely, so usually RPA does not replace the complete set of tasks an employee is managing, but instead parts of it. The optimal end-result is that employees can move to working on more interesting, value-adding, tasks after they are relieved of their boring routines. In any case, communicating the impact on jobs early in the process can be important to have a more engaged staff involved in RPA implementation and to avoid possible internal sabotage of the effort by employees. (Lacity and Willcocks, 2016b) Hallikainen et al. (2018) note that having employees feel at ease is important, because the people closest to the automated processes are the process specialists and so it is important to engage them in the automation effort.

Knowledge in organizations about RPA is increasing rapidly, but for the time being an initial challenge may be to really understand what RPA is and where it can be applied. This was seen as a challenge, even if not as a significant one, in Suri et al. (2017). Also the IT function may experience initial difficulty understanding how RPA works and how it is different from more simple solutions like screen scraping of information (Lacity and Willcocks, 2016a). Other fears at IT might be information security issues and the fact that the software bots are essentially often programmed by the business and not IT as has been customary up until now with automation efforts (ibid).

As continuation of the previous challenge, another challenge can be the division of responsibility between IT and other business functions (Suri et al., 2017). Since IT systems development has traditionally belonged to the domain of the IT function, there can be an urge to just include the RPA effort as something for IT to handle entirely. Lacity and Willcocks (2016a and 2016b) do suggest taking IT on board early in the process e.g. so that they can evaluate possible risks to the systems environment. However, as already noted earlier, also the business functions using RPA to automate their processes need to be heavily involved and assume responsibility for the effort at their end (Lacity and Willcocks, 2016a; Hallikainen et al., 2018).

RPA has been noted to work best for highly standardized processes (Lacity and Willcocks, 2016a). Thus, low standardization of processes may pose a challenge in implementing RPA (Suri et al., 2017). Even a fairly complex, but clearly defined rules-based process can be completed by RPA, so simplicity is not a prerequisite (Lacity and Willcocks, 2016a).

Seeing the absence of standard processes as a challenge implies that a certain degree of standardization is a prerequisite for implementing RPA.

Suri et al. (2017) also cite the lack of resources and budget constraints as possible challenges recognized in companies. This is understandable since service centers performing transactional processes may often be seen as mainly cost generating units adding little value and, thus, are under constant pressure to keep costs low and efficiency high. On the other hand, Lacity and Willcocks (2016a) show evidence that RPA investments provide fast payback and a solid return on investment. Hence, the challenge may then lie in selling the investment to management with a strong business case (Suri et al., 2017).

To conclude, a list of the main challenges from the survey by Suri et al. (2017):

1. Lack of standard processes
2. Fear of job loss by employees
3. Lack of resources
4. Unclear division of responsibilities between IT and functional organizations
5. Budget constraints
6. Lack of management support
7. No viable business case
8. The fear to automate a messy process instead of streamlining it
9. RPA solutions are very expensive and pricing policy very obscure
10. Weak change management process across the organization, especially in IT
11. Lack of understanding of what RPA means and where it can be applied

3 Capabilities

This section will outline the progression in strategic management research from the resource-based view (RBV) to the later emerged concept of dynamic capabilities. The importance of the concept of dynamic capabilities has been recognized widely, but its origins, definition and relation to other concepts like resources, processes and capabilities has been a cause for much debate. This section will begin with the theoretical origins of capabilities research. Next, definitions of capabilities are discussed. Furthermore, the development and microfoundations of capabilities are covered, i.e. how they come to exist. Finally, a summary of the literature from sections two and three will be presented.

3.1 Evolution from the resource-based view to capabilities

In the field of strategic management, the RBV is a popular and long-standing theoretical framework for explaining the source of competitive advantage of firms (see e.g. Penrose, 1959; Barney, 1991; Amit and Schoemaker, 1993; Teece et al., 1997). Barney (1991) argues sustained competitive advantage to stem from the assumption that firm resources are heterogeneous and immobile. However, according to this view, not all resources are seen as having potential to build sustained competitive advantage, but only those resources possessing what are called VRIN (valuable, rare, inimitable, non-substitutable) attributes (Wernerfelt, 1984; Barney, 1991). Barney (1991, p. 101) defines firm resources as including "all assets, capabilities, organizational processes, firm attributes, information, knowledge, etc." These resources can be further classified into physical (e.g. technology, plant and equipment), human (e.g. training, experience, intelligence, relationships) and organizational capital (e.g. reporting structure, planning and controlling systems and the firms relations with groups external to the firm) (ibid). In contrast to Barney (1991), Amit and Schoemaker (1993, p. 35) differentiate between resources and capabilities by defining the latter as being "a firm's capacity to deploy resources…using organizational processes". Ethiraj et al. (2005, p. 27) note that there exists agreement in the field of strategic management research that "both resources and capabilities are essentially assets with rent-generating potential".

3.2 Definitions of capabilities

The RBV was seen as a too static view to explain competitive advantage in dynamic markets experiencing fast-paced market and technological change (i.e. essentially a

Schumpeterian world of creative destruction) (Teece et al., 1997; Eisenhardt and Martin, 2000). The dynamic capabilities framework emerged to extend the RBV in these markets (Teece, et al., 1997). Teece et al. (1997, p. 516) define dynamic capabilities as "the firm's ability to integrate, build and reconfigure internal and external competences to address rapidly changing environments". However, some later views have stressed that a dynamic or volatile environment is not a prerequisite for a capability to be dynamic (Ambrosini and Bowman, 2009).

Dynamic capabilities have been criticized for being a vague, elusive and tautological concept and even its existence has been questioned (Williamson, 1999; Kraatz and Zajac, 2001). These accusations have been countered by emphasizing that dynamic capabilities really are concrete firm-specific and strategic processes, like product innovation or alliancing, used by managers to modify their available resources (Eisenhardt and Martin, 2000: p. 1111). Eisenhardt and Martin (2000, p. 1111) assert that dynamic capabilities have some common features between firms meaning that best practices can be recognized. Because of this, they argue dynamic capabilities not to be a source of sustained competitive advantage by themselves as other firms have the possibility to develop similar capabilities (ibid, p. 1110). Teece (2014, p. 330) agrees that dynamic capabilities by themselves probably will not be sufficient to attain competitive advantage. Instead, dynamic capabilities require also idiosyncratic resources and a working strategy for additional support in this endeavor (ibid). However, he (Teece, 2007; 2014, p. 338) rejects the comparison by Eisenhardt and Martin (2000) between dynamic capabilities and best practices. According to Teece (2014, p. 338), Eisenhardt and Martin (2000) are actually referring to the more simple ordinary capabilities where best practices can be benchmarked.

As the concept of dynamic capabilities can be challenging to grasp, many authors have sought to explain what they really are (e.g. Eisenhardt and Martin, 2000; Winter, 2003; Ambrosini and Bowman, 2009; Pavlou and El Sawy, 2011). Winter (2003) explains capabilities as a hierarchy of ordinary, so-called "zero-level", capabilities which allow firms to run their day-to-day operations and, higher-order, dynamic capabilities which are used to "extend, modify or create ordinary capabilities". Similarly, what Winter (2003) calls ordinary capabilities are coined substantive capabilities by Zahra et al. (2006). These distinctions are important as their hierarchical nature brings structure into the dynamic

capabilities framework and dispel some of the vagueness of the concept. Also, Teece (2014) points out that comparing dynamic to ordinary capabilities can improve the understanding of what dynamic capabilities really are. Table 2 below illustrates some main differences between the concepts.

	Ordinary capabilities	Dynamic capabilities
Purpose	Technical efficiency in business functions	Achieving congruence with customer needs and with technological and business opportunities
Mode of attainability	Buy or build (learning)	Build (learning)
Tripartite schema	Operate, administrate, and govern	Sense, seize, and transform
Key routines	Best practices	Signature processes
Managerial emphasis	Cost control	Entrepreneurial asset orchestration and leadership
Priority	Doing things right	Doing the right things
Imitability	Relatively imitable	Inimitable
Result	Technical fitness (efficiency)	Evolutionary fitness (innovation)

Table 2. Some differences between ordinary and dynamic capabilities (Teece, 2014)

Teece (2014, p. 330) explains that "ordinary capabilities are embedded in some combination of (1) skilled personnel, including, under certain circumstances, independent contractors; (2) facilities and equipment; (3) processes and routines, including any supporting technical manuals; and (4) the administrative coordination needed to get the job done". The pursuit for speed, quality and efficiency underlies ordinary capabilities. Thus, ordinary capabilities take a rather operations and administrative view of the organization. Competitive markets, with consultancies offering industry best practices, diffuse these types of capabilities rendering them mostly useless for firms seeking competitive advantage in the longer term. This diffusion into other companies and industries happened e.g. to the Toyota Production System of lean production. (Teece, 2014)

Teece (2014, p. 332) breaks dynamic capabilities down into the capacities of sensing, seizing and transforming. *Sensing* consists of "identification, development, codevelopment, and assessment of technological opportunities in relationship to customer needs". *Seizing* is the "mobilization of resources to address needs and opportunities, and to capture value from doing so". *Transforming* means "continued renewal". (Teece, 2014, p. 332) The aforementioned capacities indicate that dynamic capabilities are also deeply entrepreneurial in nature as they require constant search of opportunities and following, so-called, orchestration of assets to achieve strategic outcomes (Teece, 2007; 2014).

There is consensus in the literature that an important feature of dynamic capabilities is the notion of change. However, not all change is due to dynamic capabilities. Pressures from

the environment may force change on the firm, and, as a consequence, the organization may resort to ad hoc problem solving as a response, which is not practice of dynamic capabilities. (Winter, 2003) In contrast, Teece (2012) notes that ad hoc problem solving cannot be so clearly differentiated from dynamic capabilities so as to them being entirely different concepts.

Ambrosini and Bowman (2009) synthesize past research on dynamic capabilities. They summarize the different definitions and conclude that dynamic capabilities are generic processes for altering an organization's resource base. They are usually built internally, not purchased externally from the market and their use is deliberate and not accidental (Ambrosini and Bowman, 2009).

In their seminal paper on dynamic capabilities, Teece et al. (1997) argue that firm competitive advantage resides in its processes (managerial and organizational), positions (of assets) and paths (i.e. available strategic options). These concepts are fundamental to dynamic capabilities theory and, thus, useful to elaborate on.

Managerial and organizational **processes** possess three functions: coordination/integration, learning and reconfiguration. *Coordination and integration* are static concepts where managers coordinate and integrate activity of the firm internally and externally (towards suppliers, partners, etc.). Efficient coordination and integration have the potential to produce highly coherent intra- and interorganizational connections and processes which in turn are difficult to replicate. This creates a possibility for competitive advantage. *Learning* is a dynamic concept and a process by which organizations can improve and accelerate performance as well as recognize new opportunities. *Reconfiguration* is a transformational concept and requires continuous monitoring of the environment to detect the need for change. (Teece, et al., 1997)

A firm's asset **position** constitutes its specific assets in a broad sense including e.g. technological, financial, reputational, structural and institutional assets. Essential to positions are the firm boundaries as they dictate the scope of assets within the control of the firm. Externally contracted assets may hamper the coordination of said assets. (Teece et al., 1997)

A firm's future is path-dependent, i.e. its future options depend on the **paths** ahead and its current position which in turn is dependent on its earlier experiences. This implies that the

firm's options for the future are finite. Significant contributors to future paths are technological opportunities which are also, depending on the situation, firm specific. (Teece et al., 1997)

This study will use the definitions from the latest advancements of Teece's (2014) thinking to conclude that a capability is "a set of current or potential activities that utilize the firm's productive resources to make and/or deliver products and services", and that "ordinary capabilities involve the performance of administrative, operational, and governance-related functions that are (technically) necessary to accomplish tasks". Finally, "dynamic capabilities involve higher-level activities that can enable an enterprise to direct its ordinary activities toward high-payoff endeavors". (Teece, 2014, p. 328)

3.3 Origins of capabilities

Capabilities are formed passively when organizations accumulate tacit knowledge through learning-by-doing, which in time is embedded in organizational routines and processes (Ethiraj et al. 2005). This view suggests that earlier firm history matters in capabilities development and, as such, is aligned with the notion of path-dependency (Teece et al., 1997). In addition, capabilities are created more deliberately through investments in learning (Zollo and Winter, 2002). The development of capabilities is affected by the choices that business owners and managers recognize (Zahra et. al, 2006; Narayanan et al., 2009). These are some of the explanations given in the literature on how capabilities come to exist. The following subsections will delve deeper into these topics.

3.3.1 Microfoundations

For understanding how capabilities come to exist, the concept of microfoundations is of elementary importance as they are "the underlying individual-level and group-level actions that shape strategy, organization, and, more broadly, dynamic capabilities, and lead to the emergence of superior organization-level performance" (Eisenhardt et al., 2010, p. 1263). In the case of dynamic capabilities, according to Teece (2007, p. 1319), its microfoundations are "distinct skills, processes, procedures, organizational structures, decision rules, and disciplines". Hence, understanding microfoundations is important for being able to develop capabilities.

Gavetti (2005), as well as Eisenhardt et al. (2010), note that initial research on capabilities was guided predominantly by evolutionary economics (Nelson and Winter, 1982) leading to the view that the microfoundations of capabilities existed in seemingly automatic routines. Later research has contrasted this view in highlighting the more active role of cognition and organizational hierarchy in capability development (e.g. Gavetti, 2005; Teece, 2007; Laamanen and Wallin, 2009; Narayanan et al., 2009; Eisenhardt et al., 2010; Danneels, 2010; Helfat and Peteraf, 2015).

Gavetti (2005) emphasizes that routines, cognition and organizational hierarchy all impact the formation of capabilities. Cognition can be described as mental activities and mental structures, where research on management has concentrated on the latter (Helfat and Peteraf, 2015). The cognitive positions of organizational actors affect the decisions taken and the subsequent outcomes (Teece, 2007). Cognitive abilities do not spread evenly among members of organizations or between organizations, meaning that their possibilities to recognize opportunities vary (ibid).

Especially managers' cognitive representations are argued to steer the formation of capabilities (Gavetti, 2005) in accordance with bounded rationality (Simon, 1955). Bounded rationality posits that human cognitive abilities are limited and managers have a tendency to e.g. make simplifications of their decision problems (Simon, 1955; Gavetti 2005). As actual organizational decision-making situations are often characterized by a lack of time and limited information, managers may resort to heuristics (i.e. rules of thumb) (Eisenhardt et al., 2010). This should not be viewed necessarily as negative since it adds flexibility at times when it is required and may bring about the appropriate balance between efficiency and flexibility in organizational processes and structures (ibid).

Narayanan et al. (2009) draw on strategic process research in formulating a process model for capability development. They emphasize human agency in the form of the cognitive orientation of senior management and managerial actions as relevant in capability development. The cognitive orientation of managers relates to how they conceptualize the environment and what their beliefs are. Teece (2012) also highlights the role of human agency in promoting the role of entrepreneurial action. He argues that ordinary capabilities may be linked more tightly with routines whereas dynamic capabilities also require agency from the top managers. According to Teece (2012), this is reflected for example in the

existence of a market for senior managers specialized in company turnarounds. Non-routine capabilities are, thus, sometimes sourced from outside the organization (ibid).

Adner and Helfat (2003) propose the concept of dynamic managerial capabilities which consist of managerial human capital, managerial social capital and managerial cognition. Managerial human capital concerns the expertise a manager has accumulated through experience. Managerial social capital relates to possible beneficial social ties with members from within and external to an organization which bring about positive effects in a business environment. Managerial cognition here relates the cognitive abilities already referred to earlier where e.g. management's perceptions and assumptions impact their decision-making. Managerial capabilities contribute to heterogeneity in management decision-making. (Adner and Helfat, 2003) In a similar vein, Helfat and Peteraf (2015) suggest the concept of managerial cognitive capabilities, also underlining the significance of managerial cognition.

3.3.2 Learning

According to the knowledge-based view of the firm, knowledge is an essential resource (Easterby-Smith and Prieto, 2008). Several authors have linked organizational knowledge and dynamic capabilities (e.g. Eisenhardt and Martin, 2000; Zollo and Winter, 2002; Prieto and Easterby-Smith, 2006; Easterby-Smith and Prieto, 2008). In their case study of a leading chemical company, Prieto and Easterby-Smith (2006) display how organizational knowledge may act as a source for dynamic capabilities. According to Prieto and Easterby-Smith (2006), there are two main strands of literature in organizational knowledge and knowledge management: technological and social. The technological perspective is more interested in the systems available for knowledge management while the social perspective is interested in the people involved in constructing knowledge (ibid). Table 3 below illustrates the differences between the two perspectives.

Theoretical lens	*Treatment/modelling*	*Conception of KM*
Technology perspective	• Rooted in a view of knowledge as a cognitive possession • Information gathering and analysis are central to organizational learning, as they enable change in existing schemas of reality, which is knowledge • Individuals only constitute a small part of organizations	• KM focuses on effective information seeking, processing and codifying in order to make decisions that optimise the organization/ environment relationship • KM enables organizations to build formal/tangible systems which enhance internal learning • Key KM features comprise IT infrastructures, and other technical and managerial systems
Social perspective	• Rooted in a view of knowledge as a social construction • Social activity and discursive behaviour are central to organizational learning, as they support the social construction of reality • Organizational members, individually or collectively, question and reflect on their own working processes	• KM aimed to enhance shared interpretation processes by organizational members in order to make sense of the environment • KM is about building informal/intangible learning environments supported by appropriate kinds of behaviour • KM is designed around social relations and more cultural enablers. IT makes things easier, but only as tool to increase work efficiency

Table 3. Two perspectives on organizational knowledge and knowledge management (KM) (Prieto and Easterby-Smith, 2006)

Dynamic capabilities and knowledge management have been considered somewhat overlapping concepts with potential for convergence. Both fields recognize the importance of learning as knowledge management has been considered a type of "managed learning" whereas learning capabilities take part in the forming of dynamic capabilities. Both fields also recognize a need for the exploration (aiming for innovation) and exploitation (aiming for efficiency) of knowledge. Furthermore, both streams of research have discovered knowledge resources to be valuable in the pursuit for competitiveness where knowledge resources act as a form of infrastructure. (Easterby-Smith and Prieto, 2008)

Easterby-Smith and Prieto (2008) develop an integrated model which links knowledge management and dynamic capabilities together by way of learning processes. Here, learning processes are defined as second-order capabilities molding the dynamic capabilities (ibid).

In their study on developing alliance capability, Kale and Singh (2007) demonstrate that alliance learning processes involving articulation, codification, sharing and internalization of alliancing know-how are positively related to a firm's alliance success. Also positively related are the existence of an alliance function within the firm and its alliance learning process (ibid). As a result, presuming that alliance success signals the existence of an alliance capability, learning processes can be used to build alliance capabilities.

Also Heimeriks et al. (2009) study the development of capabilities in an alliance management setting. As firms transfer in their alliance strategies from bilateral partnerships towards broader portfolios, so-called learning-by-doing may be too slow an approach in capability development leading the authors to propose four types of more deliberate learning mechanisms to speed up the development effort. These mechanisms are: functional and staffing solutions, tool based solutions, training solutions and third party solutions. Descriptions and examples of these solutions are depicted in Table 4 below.

Solution category	Descriptions
I. Functional and staffing solutions	Units or functions within units which are mandated with responsibility for managing and coordinating alliance activities within the firm e.g. alliance manager, Vice-President of alliances, alliance department.
II. Tool based solutions	Instruments containing guidelines on alliance management issues within different stages of the alliance life-cycle. E.g. partner selection protocol, joint business planning, codified best practices.
III. Training solutions	Programs organized internally or externally to nurture understanding of and accountability for critical issues in alliance management for the employees involved. E.g. in-house company courses, intercultural training programs, courses by external experts.
IV. Third-party solutions	Outside experts who provide specialized content related, for instance, to conflict mediation, legal issues, financing, and alliance management. E.g. consultants, financial experts, mediators, legal experts.

Table 4. Four types of alliance management solutions (Heimeriks et al., 2009)

Andreu and Ciborra (1996) emphasize learning in the development of core capabilities, but they add the role of IT as a participant in the development process. IT can support in the learning processes in transforming resources into capabilities and further into core capabilities, but it may also itself be embedded in the core capabilities to form strategic information systems. Thus, IT has the potential to transform from a mere commodity into a more strategic asset. Here, core capabilities are akin to dynamic capabilities before the concept of dynamic capabilities was widely accepted. (Andreu and Ciborra, 1996)

Zollo and Winter (2002) propose three types of learning mechanisms involved in building dynamic capabilities, namely: experience accumulation, knowledge articulation and knowledge codification. Experience is tacitly accumulated in organizational routines whereas knowledge articulation is a more deliberate attempt at collective learning where members of the organization explicitly express and share their experiences. Knowledge codification reaches beyond simple articulation and manifests itself in the form of manuals,

process descriptions and other similar tools. The value of codification lies, not only in the tools it produces, but also in the learning processes which normally occur during the codification process. Knowledge codification has the potential to produce new ideas and suggestions for improvement to the existing routines. (Zollo and Winter, 2002)

These learning mechanisms differ greatly in the investments in resources (financial, time and cognitive effort) that they require. The investments increase as a firm moves up the ladder from experience accumulation to knowledge articulation and finally knowledge codification. An experience accumulation investment may be as simple as setting up a new function within the organization where new experience will accumulate. More deliberate investments in time and effort are made when the aim is knowledge articulation. Also opportunity costs are relevant here to account for the fact that the participating members may have other projects and tasks to work on. Knowledge codification is the most costly investment as it involves effort first in the other two learning mechanisms and finally the development of a tool for codification (such as a manual). The decision on how far an organization wants to go in its learning investments is not an easy one as the related costs and benefits are situational. Especially the benefits may be difficult to anticipate in advance. (Zollo and Winter, 2002)

Zollo and Winter (2002) argue that the value of knowledge articulation and codification increase as task frequency and homogeneity decrease. The rationale for this is that lower frequency activities cannot rely on the memory of individuals and also the related coordination and opportunity costs are lower for low frequency tasks improving the return on investment. In addition, more heterogeneous activities are disadvantaged due to the difficulty of generalization from one task to another, and thus the value of more explicit articulation and codification increase. (Zollo and Winter, 2002)

3.3.3 Investments

Capabilities can also be created and developed through investments in them (e.g. Maritan and Alessandri, 2007; Coen and Maritan, 2011; Maritan and Lee, 2017). Maritan and Lee (2017) couple resource allocation research with a resource and capability view to draw three types of connections between resource allocation and capability development. First, capabilities are built through capital investments in resources which then contribute to an organizational capability. Second, resource acquisition to build capabilities is a matter of

resource allocation and, thus, the resource allocation process matters in capability development. Third, resource redeployment within the firm is a form of resource allocation where resources (e.g. skilled labor) can be shifted from one use to another and impacting in this way capability development. (Maritan and Lee, 2017)

Taking a resource and capability view to resource allocation, along the lines of Maritan and Lee (2017), helps connect firm strategy to resource allocation more tightly as capabilities are developed out of a combination of resources to support strategy implementation. Hence, from a capabilities perspective, capital investments are more than simple asset acquisitions (Maritan and Lee, 2017), they actually support in the accumulation of capabilities.

In her case study of a Fortune 500 pulp and paper company, Maritan (2001) identified separate investment processes for investments into existing and new capabilities. The differing processes seemed to emerge by accident without any intention. Maritan (2001) suggests that acknowledging these differences would enable a deliberate contingency approach for capability investments where the type of investment and process could be coupled. This matching between investment type and process would then constitute a dynamic capability of its own as it enables changing the operating-level (i.e. ordinary) capabilities through improved management of investments (Maritan, 2001).

3.3.4 Make or buy

A central construct in capability research is the strategic factor market where firms gain access to resources or factors of production (Leiblein, 2011). Factor markets vary in their degree of efficiency and it is possible that especially the market for resources and capabilities, being more valuable and rare than simple factors of production, may be more susceptible to inefficiencies and, thus, arbitrage opportunities arise (ibid, p. 913).

However, literature on the RBV is undecided as to whether the heterogeneous resources and capabilities can be acquired from the strategic factor market or if the only option is to build them internally (Maritan and Peteraf, 2011). To bridge these differing views, Maritan and Peteraf (2011) suggest not to consider the decision as either-or, but rather to look at making and buying jointly in the development of heterogeneous resource positions. Introducing a process perspective, together buying and making can form a virtuous cycle

of capability development where the focus is less on the strategic factor markets or the tradability of resources (ibid).

3.4 Summary of the literature review

To summarize the literature presented in sections two and three, process automation has since the industrial revolution progressed from the factory floor to the office spanning now what are called business processes. The 1990s with its increasing market dynamism and IT capabilities brought about new progress in the theory on business processes. BPR emerged, later replaced by the more holistic approach of BPM.

RPA is an emerging technology for automating business processes and, as such, continues the tradition of business process automation. Existing research on the topic is still very scarce for the time being. However, some initial contributions exist outlining the benefits and challenges of RPA adoption. (Lacity and Willcocks 2016a, 2016b; Suri et al., 2017)

A progression has also taken place in the evolution from the RBV to dynamic capabilities. Capabilities can be classified into a hierarchy of ordinary (or zero-level or substantive) capabilities targeting efficiency in operations and dynamic (higher-order) capabilities targeting innovation. Dynamic capabilities are inherent in the capacities of sensing, seizing and transforming. Typically ordinary capabilities can be bought from the market while dynamic capabilities are more unique and firm-specific, meaning that they usually have to be built internally by the firm. (Winter, 2003; Zahra et al., 2006; Teece, 2014)

Capabilities can develop relatively passively through learning-by-doing, but more deliberate learning efforts can also be deployed and capabilities may also be accumulated through a combination of investments in resources and learning processes. The cognitive representations of organizational actors, but especially those of managers, as well as hierarchies impact capability development. (e.g. Zollo and Winter, 2002; Gavetti, 2005; Prieto and Easterby-Smith, 2006; Kale and Singh, 2007; Teece, 2012; Maritan and Peteraf, 2011; Maritan and Lee, 2017)

A small amount of research has developed which combines dynamic capabilities and BPM (e.g. Trkman, 2010; Niehaves et al., 2014). Research on BPM development has typically relied on maturity models, but it has been argued that dynamic capabilities could be a more

suitable framework in order for BPM to be able to provide some normative prescriptions for BPM capability development (Röglinger et al., 2012; Niehaves et al., 2014).

All of the above will provide the theoretical reference for the remainder of this study in fulfilling its objectives, i.e. to examine the benefits and challenges associated with RPA adoption in organizations and to explain what a RPA capability consists of and how it is developed. In addition, the literature here provides support in the discussion on the role of RPA in the context of the dynamic capabilities framework in combination with BPM.

4 Research method

This section will begin with justifying the methodology and research method. Next, data collection and analysis will be covered. Last, discussion on the limitations as well as possible issues on validity, reliability and generalizability of the study will take place.

4.1 Cross-sectional field study

The chosen methodology of this study is qualitative (as opposed to positivist). Qualitative research is interpretive and relies on rich empirical material (Vaivio, 2008). It relates to "the expression of a subjective reality more than clarification of an objective one." (Ahrens and Chapman, 2006, p. 819) The research domain is the space where data is collected and the field can be seen as one of those domains (Ahrens and Chapman, 2006). Ahrens and Chapman (2006) also emphasize the processual character of different phenomena and how qualitative field study approaches can help preserve the richness of data. As core objectives of this study are to understand how RPA capabilities are developed in organizations, as well as learning what the perceived benefits and challenges of RPA are, the most appropriate solution was to engage in qualitative field research to understand how and why events unfolded and to account for contextual variables. The field in this study constitutes the five large corporations where interviews were conducted.

More specifically, this thesis takes a cross-sectional field study approach. The specific value of cross-sectional field studies lie in their positioning between surveys and case research. In contrast to in-depth case studies, the method provides a broader perspective to the phenomena under study while at the same time providing more depth than a pure survey-based study. This enables a relatively high amount of observations, but also allows the researcher to ask "how" and "why" questions to dig a bit deeper. The method is especially fitting when there is an ample existing theoretical base, but its constructs or empirical interpretation are under doubt. (Lillis and Mundy, 2005) This is very much the case for the dynamic capabilities framework, as was shown earlier in the review on the extant literature. Dynamic capabilities have been called a black box (see e.g. Pavlou and El Sawy, 2011; Sirmon et al., 2007) and a significant amount of the research has focused on clarifying the concept itself (see e.g. Eisenhardt and Martin, 2000; Winter, 2003; Ambrosini and Bowman, 2009; Helfat and Winter, 2011) whereas actual empirical investigation in the field has been infrequent.

The approach of this study also resembles that of a multiple case study, but Lillis and Mundy (2005) delineate between cross-sectional field studies and multiple case studies where the former are more flexibly concerned with observable occurrences while the latter are pursuing more depth in order for the data to constitute a 'case'. This distinction is concerned with a divide between breadth and depth. This thesis aims to understand the potential benefits and challenges as well as the building of RPA capabilities more broadly in organizations for the sake of providing general observations on the adoption of an emergent technology and to scope out also managerial implications. This broad approach is justified as most organizations do not have lengthy experience of RPA usage and so more study sites are needed to make these observations. Because of this temporally short experience with the technology, a longitudinal approach is also difficult to set up.

Dubois and Gadde (2002) question how a study limited in both depth and breadth could contribute to any substantial analysis. With this, they refer mainly to multiple case studies, but it could be seen also as a criticism of cross-sectional field studies as they possess similar characteristics in their restrictions in depth as well as width. However, Lillis and Mundy (2005) remind that research questions are varied in their complexity and not all questions require the same depth in engaging with the field.

Scapens (1990) distinguishes case/field-studies into five categories based on their objectives: descriptive, illustrative, experimental, exploratory and explanatory studies. The objectives of this thesis are mainly descriptive and explanatory. They are descriptive in their attempt to describe current practice of RPA adoption and capability development and explanatory in their aim to uncover the rationale of this practice.

4.2 Data collection and analysis

The data is gathered by way of standardized, semi-structured interviews to allow for comparisons between sites (i.e. the studied organizations) while simultaneously supporting the collection of narrative data (e.g. in answering the research question on how to develop capability for RPA). This is also in line with the reasoning of Lillis and Mundy (2005). Also some internal documentation was available on the part of some of the companies, but this served mainly as additional background information.

In total 10 interviews were conducted with 13 representatives of five large companies based in Finland. The companies all represented different industries and they were at different stages in implementing RPA. The undersigned is in close relation to one of the studied companies and access to the other companies was gained through further connections from this one company. Some interviews were confirmed once the initial contact had been established and additional queries opened up further contacts within the companies. In their respective companies, the interviewees worked in different finance roles like treasury, shared services and development while some others had a more technical background with a role in specifically directing the RPA effort. All interviewees had some experience with RPA in one form or another and almost all were in a management position.

All interviews were recorded and transcribed. The interviews lasted from 34 minutes to 1.5 hours with the average being exactly one hour. The interviews were mainly conducted as single-person interviews. Two of the interviews consisted of having more than one interviewee present simultaneously: one with two interviewees and one with three interviewees. A listing of interviews can be found in Appendix A and the questions template for the interviews in Appendix B.

Analysis of data was approached in a thematic manner. Relevant themes emerged both inductively from the data as well as deductively from the literature. Emergent themes were coded in the margins of the transcribed interview notes and compared across all interview notes to recognize patterns. (Boyatzis, 1998)

4.3 Limitations

Frequently cited limitations or weaknesses of field studies are their low reliability, validity and generalizability (e.g. McKinnon, 1988; Ahrens and Chapman, 2006; Eisenhardt and Graebner, 2007). Even if e.g. Ahrens and Chapman (2006) and Vaivio (2008) note that these calls have been made more from the camp of positivist researchers, it is useful to discuss these possible issues in the context of this study.

According to McKinnon (1988), issues of reliability and validity have not traditionally been given enough concern in qualitative research. On the other hand, qualitative field research need not follow the standards for reliability and validity set by the positivist

research stream (Scapens, 1990; Ahrens and Chapman, 2006). Adhering to requirements of a completely neutral researcher (reliability) working to understand an objective reality (validity) is not of much use in qualitative field research (Scapens, 1990).

McKinnon (1988) defines validity and reliability in a broad sense in order to have a functioning definition applicable across different research methods. Validity, in its broad sense, is a question of whether or not the focus of the study really is on the intended phenomenon. Reliability, also broadly speaking, is a question of whether or not the gathered data is reliable. McKinnon (1988) also lists four main types of threats to validity and reliability in field studies, namely: observer-caused effects, observer bias, data access limitations, complexities and limitations of the human mind. To alleviate these threats, three strategies are suggested for the researcher: spending a substantial amount of time in the field; usage of multiple methods and observations; and being mindful of one's own behavior. (McKinnon, 1988)

In this study, only a limited amount of time was spent at each particular site, i.e. at each company. However, multiple observations were gathered by using the same interview template for the interviews and more than one respondent per company with the exception of one (Delta). Also care was taken in engaging with the field. Interview questions were sent beforehand and confidentiality issues were openly discussed along with assuring anonymity in the final work. This behavior served in building rapport with the interviewees.

According to Eisenhardt and Graebner (2007), one benefit of multiple case studies is the improved generalizability of the results if compared to single-case studies. Though this thesis may not qualify as a multiple case study, the interview data collected more broadly from the field – constituting large corporations in this case – can be argued to be more supportive for generalizations to be made than had this study focused on only a single case. Following from this, it also may be better suited for giving more practical managerial recommendations. However, Vaivio (2008) cautions against making too broad generalizations in qualitative research and the discussion part of this study will bear this in mind.

In general, a limitation of this study is that RPA is such a young technology that companies do not have vast experience in its use. Although three of the companies could be

considered early adopters of the technology, even they did not have many years of experience with RPA. Thus, research conducted at a later time may improve the quality of the findings. At the same time, also a strength of this study is that the companies were at different stages in their RPA adoption. This brought about a combination of retrospection and real-time cases which Eisenhardt and Graebner (2007) mention as an approach to limiting bias. In addition, the interviewees represented different roles and even different companies which reduces the possibility for retrospective sensemaking of the interviewees and therein also limits bias (Eisenhardt and Graebner, 2007).

5 Field study findings and analysis

The field study was conducted via interviews in five large corporations based in Finland of which four are listed on the Nasdaq OMX Helsinki stock exchange. The companies represent varied industries from manufacturing to media, high-tech and financial services with both business as well as consumer customers. The companies are given aliases in this study to protect their privacy. They will be referred to in the following as Alpha, Beta, Delta, Zeta and Omega. All of the companies have annual revenues exceeding EUR 1 billion.

5.1 Still early days for RPA

The studied companies varied in their level of maturity with regards to RPA adoption. At the time of the study, one of the companies was only now starting its journey with RPA doing first proofs of concept while some others were already operational and using software bots regularly. However, there were significant differences in RPA adoption maturity even within the companies between their different business units and functions. This is understandable given the large size of the companies and their differing operating environments, organizational structures and businesses. For some units, RPA might act as a more strategic lever for seeking competitive advantage whereas for others it is only a tool among others in the search for efficiency.

> *"For them [the service business unit] the business case and drive was so clear. For us [the finance function], RPA is [just] one thing. They [the service business unit] took it a few years back…that with this [RPA] they're actually really going to seek that efficiency and that quality, because you kind of understand it from the perspective that the service business, it's quite a low margin business and there this leverage [from RPA] can actually be quite significant." (Vice President, Finance Processes and Systems, Alpha)*

As for RPA use at the finance function, most of the studied companies were very much in the beginning still building their teams, searching for opportunities and use cases and sharing knowledge about RPA within the organizations. Also similar were the ways in which the companies were starting off their RPA implementation. There was a clear sense of urgency in getting the projects started and achieving initial results. Artificial intelligence and automation have received considerable attention in the media as of late and global strategy and technology consultancies are also eagerly spreading the message on the potential of these technologies. This had not gone unnoticed at the studied companies.

Hence, an understanding existed that these new technologies could be of value to the companies, but the work to understand which tools are relevant and where they can be used in the respective businesses was partly still underway. With RPA being such a new technology and there not being much in the way of best practices, the companies often adopted an experimenting approach to start learning more.

> *"The way we started with RPA was that we just start doing, to get a foot in the door, to get it established here at Delta. As far as possible in a way that yes, we do take the stakeholders into account, but still...just bring in the tool. A 'Just Do It' mentality was pretty much the thinking there." (Head of Robotics, Delta)*

> *"Typically these kinds of projects are started with a heck of a technology assessment. We skipped that entirely. We take what's available and start doing, but now we're maybe at the point where we need to think about how we make sure this is sustainable what we're doing here." (Head of Finance Development & SSC, Omega)*

In the bigger scheme of company strategy, RPA was viewed as a tool among others in strategy implementation. Other technological solutions the companies were looking into included chatbots, machine learning, natural language processing and data analytics, among others. The driver for this search of new technologies is the digitalization of society which most large companies have by now recognized in their strategies. The possibility for these technologies to also work together was identified where one type of technology would be used for a part of a process and another technology would pick up the following step in the process. One mentioned example would be machine learning combined with RPA where the initial assessment of customer requests in a web portal would be done by a neural network trained with machine learning and the following rules-based process of completing the request can be completed with RPA.

5.2 Use cases

Several application areas or so-called use cases for RPA were identified in the interviews. As some interviewees represented finance and others were more technically oriented robotics responsibles, a broader view was gained across the different organizational activities.

The companies which were further ahead in their RPA adoption had implemented it in their core business. Delta had already several use cases in its core business as well as

support functions. RPA was used in all of its core business areas. For example as a part in the processes of granting loans and insurance claims handling. In the loan granting process RPA is used, among other things, in compiling the cover sheets automatically on loan offers to be sent to the applicants. This was referred to by the Head of Robotics at Delta as "showeling work" where the software is set up in many parts of the process to complete the repetitive high-volume tasks. RPA was also monitoring the payment flow from accounts by checking their balances.

On the IT side software bots were used in creating user IDs and access rights to IT systems after they had been signed off by a human approver first. For the HR function, Delta had automated part of the new employee onboarding process where input into systems was required for different employee-related data.

Furthermore at Delta, regulatory changes led to projects which required lots of capacity from RPA. These projects were often rather brief in length yet heavy in their requirements for repetitive, routine work as they might require completing tasks for all or most customer accounts. Here, the personnel could focus on the customer-facing activities like contacting customers while the robots completed the process in the company systems.

Also heavily utilizing RPA in their core business was Alpha. The early adopter was the Service Business Unit which uses RPA in the maintenance of telecom networks. Here, the first use case was the managing of network-related alarms and the initiation of actions to keep the network available. Robotizing the so-called alarm monitoring function means that the software monitors incoming alarms and triggers action based on a list of options like sending a field technician to solve the case or to escalate the incident for further troubleshooting. The process is very high-volume with alarms in the order of hundreds of thousands to a million each year.

Later on, Alpha's Service Business Unit has progressed to using RPA almost all over its service delivery portfolio. Another use case here are checks done before and after software upgrades where the software bots go through checklists to make sure the environment is ready before the upgrade and again after the upgrade to check that it was completed successfully. In addition, the Service Business Unit is using software bots for testing the network quality among many other things.

Looking at all the companies under study, the company support functions are an area where the organizations are inclined to look for use cases. Support functions include usually areas like finance, HR, IT and other, typically, back-office functions. Often, in larger companies, at least parts of these functions have been centralized to a Shared Service Center (SSC) where the more repetitive tasks with large volumes are handled. Because of this, the SSC processes are usually already fit better for automation. This has been recognized also e.g. by Suri et al. (2017). Business Process Outsourcing (BPO) is used in many cases in tandem with centralization to SSCs to gain further savings from labor arbitrage.

All the case companies had SSCs, but each had them set up somewhat differently. BPO was used to varying degrees with two of the companies having their SSC entirely consisting of its own, in-house, personnel. These companies also had more global SSCs serving, in one way or another, almost all the company functions. In other cases the support functions had each organized their own SSCs based on their needs, reflecting a more moderate amount of centralization.

Focusing more closely on use cases at the SSCs shows, once again, that RPA use is not limited by functional boundaries, but rather the rules-based nature of the task is the defining factor. Transactional finance tasks like journal entries, invoicing and purchase invoice handling were quickly identified in the companies as having potential for automation with RPA.

> *"In the purchase invoice side, there are the accruals of external vendor payments [with RPA]. There we get quite a lot of FTE-savings as we do them globally from here [the SSC]" (Manager, SSC, Beta)*
>
> *"Relating to accounting, in our Record-to-Report side, the discussion [on RPA use] revolves heavily around manual journals." (Director, Digital Finance, Alpha)*
>
> *"We have invoicing processes in some countries which aren't fully automated in SAP. Instead of doing changes in SAP, which are potentially slow and costly, we can optimize the processes outside of SAP with RPA." (Head of Finance Development & SSC, Omega)*

Significant potential within finance was also identified in the generation of different reports. At Alpha, the finance SSC is preparing 1600 different reports monthly in a

relatively manual fashion. Also other finance functions outside of the SSC were investigating reporting with RPA.

> *"For us, inventory reporting is quite important and there we…have tried to use robotics. The controllers in our operations and sourcing units have started to set that up with Blue Prism." (Vice President, Finance Processes and Systems, Alpha)*

> *"We are investigating relating to taxation, transfer pricing, if we can do something there [with RPA] and also relating to tax reporting, relating to the accounting." (Director, Digital Finance, Alpha)*

Also Omega was seriously investigating report generation at the SSC (not limited to the finance activities) with RPA. A sign of caution with the RPA implementation can be noticed in the following comment where initial focus has been on the "read only" tasks where the software bot only extracts or "reads" information from the systems, but doesn't complete operational tasks.

> *"We have a lot of reporting use cases where information is retracted from different systems, combined and either delivered as a report or uploaded to a reporting system. We started with these 'read only' use cases so they won't directly impact the operating systems." (Head of Finance Development & SSC, Omega)*

In some contrast to the above, the Vice President of Treasury & Financial Shared Services at Beta saw it necessary to emphasize that RPA can also be used for more complex tasks than just moving data from point A to point B. Within finance, Alpha was also investigating if intercompany reconciliations could be a viable use case, but the planning there was still in progress.

Use cases for the front-office tasks were also recognized. So-called front office robots can be used for customer-facing service personnel as an aid in completing manual tasks which usually would be done by the service staff themselves.

> *"Talking about front-office sales for example…a customer arrives [at the office] or via the phone service and they want to open a customer account right away while the customer is waiting. There, with front-robotics a, for example, small user interface is brought there [on the sales clerk's screen] where a button is pressed saying 'complete customer creation tasks' in those tens of systems where they need to be created." (Head of Robotics, Delta)*

RPA could be also used to access customer systems and input data there. One such example was found from Omega which provides maintenance on equipment at the customer's end.

> *"Data input into the customer systems: this is about integrating with our customers' digitalizing processes through their systems. For example transferring information what maintenance activities have been done to the customer [equipment]". (Head of Finance Development & SSC, Omega)*

As Lacity and Willcocks (2016b) point out in the literature, RPA competes to a certain extent with traditional BPO providers in how business processes are performed. This study supports the proposition. In choosing use cases, whether or not a process was already outsourced had an impact on how the companies could approach its automation.

> *"Looking from the standpoint of finance, we've outsourced a lot and exactly the type of stuff that would be the best type of ground for robotics. So then it's time for delicate consideration that how much, and how, we start to robotize that end." (Finance Development Director, Zeta)*

> *"If we think about [our BPO provider]…they're a cost-effective partner for producing the basic stuff, but then how much do we want to automate that little over 10.000 euros per FTE operation, does it make any sense?" (Finance Development Director, Zeta)*

Beta had its own in-house SSC which it saw as a definite advantage in getting processes automated end-to-end and also in capturing the value from RPA investments. Also, Beta saw its approach to its SSC as different to typical SSCs as it had an ambitious target to continuously transfer more work to the SSC and there RPA could serve as a lever in attaining this goal.

> *"If this [the SSC] was outsourced…you can't even be sure if you get all of the cost benefit in, if you have an outsourced SSC where they use robotics they don't necessarily let through all of that benefit. Even if they say that they will." (Vice President, Treasury & Financial Shared Services, Beta)*

In some cases, the BPO provider was already using RPA in its service delivery. BPO contracts often include an agreement for continuous efficiency improvements to be delivered with time.

> *"We've required from them [the BPO provider] a certain improvement in efficiency and they've committed themselves to this with certain means of which robotics is one. And since they operate in our systems, then we have to create for them the conditions to do this [to use RPA]. That's why it's been agreed upon already when preparing the contract that this is one such lever*

> *with which they can reach that [efficiency] and that way they can make their own margin stay stable." (Vice President, Finance Processes and Systems, Alpha)*

Out of all the companies, Beta was the leader in RPA at least within SSC and financial processes. It had implemented a major part of its automated processes within its SSC comprising finance and IT processes, but also within its treasury function as well as in its business units reaching a total of over 100 robotized processes by the time of this study and moving quickly to robotize more. Beta was looking at RPA opportunities creatively and was also sharing some of its learnings with other companies.

At the SSC, Beta had robotized e.g. intercompany payments between the group companies. Also error monitoring and error fixing was done by use of RPA. Vendor information was also being administered with the help of RPA. At the treasury department, Beta had robotized e.g. its confirmations on loans and deposits from its subsidiaries.

Like Delta, Beta had also found value in using RPA for a single one-time use for a process requiring a lot of e.g. data mining within a short period of time. One example was clearing a vast amount of payments of an internal customer as a one-time project for which there were no human resources available at the SSC. Even documentation for auditors was being provided with help of RPA at Beta. The treasury function was also using RPA for one-time data mining needs on demand. Also treasury reports were generated using RPA to leave more time for analysis and other value-adding activities.

> *"We have for example done these ad hoc robots when we've had to investigate some specific phenomenon…. We can make the robot do data mining in SAP and dig information out and, when you arrive at the office in the morning, it has dug up the information and it might be a bit in a raw format in Excel or something, but you take care of it then from there on yourself." (Manager, Cash Management, Beta)*

The above use cases illustrate the wide range of processes where RPA can be suitable. Some of the use cases have been implemented while the viability of some others is still under investigation at the companies. However, given the fair amount of cases already found and accounting for the fact that the companies are for many functions still very much in the beginning with adopting RPA, it is safe to say that many more use cases will be found. The given use cases here also do not represent an exhaustive list of current applications, but rather are the main findings highlighted by the interviewees. The following chapters will also illuminate the complexity in using RPA. The decisions to be

taken are more difficult than simply choosing a technology and automating the process by use of RPA.

5.3 Business Process Management view of RPA

A fundamental factor in gaining benefits of scale with automation is the redesign of the process to be automated. This requirement was emphasized at all the studied companies.

> *"What we always aim to do is that we don't copy the manual work as-is to the robot, but that there's always a little process reengineering…." (Head of Finance Development & SSC, Omega)*

> *"…the processes are developed and improved also before they are transferred to RPA, so even if the process has been previously performed in a certain way, we still try to…optimize them." (Manager, SSC, Beta)*

As the software bot is usually replacing activities previously performed by humans, it is necessary to design the process to be rules-based. RPA software is not cognitive (yet) and so it can only complete processes with clear and unambiguous rules. Humans, on the other hand, are able to reason themselves through a process even with somewhat lacking rules. All processes that humans are currently performing do not even have a codified process description. Hence, the minimum requirement is to create such a description. However, having a process description merely mimicking what a human would do, as such, isn't necessarily the most effective way and it doesn't deliver the best overall result.

> *"… because the robot is not a human being, so to benefit from the technology or for it to work in the best possible way, somehow the order of its activities...need to be adjusted…. When we were doing the [first use case] reports, retracting data from SAP, modifying it and preparing the report, it was implemented by doing it as the human would, but fairly quickly we discovered that people do a terrible amount of unnecessary work." (Head of Finance Development & SSC, Omega)*

> *"…the process might have originally three tasks which have been planned to be performed by RPA, but when they [the processes] are modified a little, it might be that that we can eventually do three additional tasks on the side, because we changed some phase [in the process]." (Manager, SSC, Beta)*

> *"Also what we've noticed is that when you have a clear process with as few exceptions as possible, when you take the human out from fiddling it also quality improves" (Vice President, Finance Processes and Systems, Alpha)*

Simply automating the existing processes was clearly not enough based on the experiences at the companies. The processes required redesign if the organizations were to draw more

significant benefit. This presented some issues and it highlights how the approach and implementation with RPA could possibly have a severe impact on the success of the initiative.

An important technical factor to consider is the current IT systems environment of the organization. The current systems play a major role as RPA works through the presentation layer in the existing systems. The legacy systems in the studied companies proved to be a major hindrance in redesigning the processes to fit for RPA.

Alpha had completed a large acquisition a bit over a year ago and this implied some growing pains and strain on systems integration. The Vice President at finance explained the situation in the following way:

> *"What happens in practice when two large corporations are bundled together is that for each process there are at least two tools. At least two. And what we started doing was to choose those tools, to choose…how certain processes are ran and are either of those tools that we have in use, or we could have even three or four [tools], that is any one of those suitable." (Vice President, Finance Processes and Systems, Alpha)*

Even if the systems landscape would be made more suitable for automation, the Vice President saw further challenges cropping up. Processes weren't in all cases mature and harmonized enough for RPA. He continued:

> *"Then, after that, we talk about, okay, we have this targeted process [to be automated], then we need to be able to ask if we go and automate it directly when it's possible and in rather many cases we've noticed that it can't be done directly, because there are so many exceptions in the process that it just isn't worth it. There's no payback. Which then gives us the impression that now we need to…harmonize the process much more radically than we may have thought initially. (Vice President, Finance Processes and Systems, Alpha)*

Harmonization and standardization were prerequisites for automation which emerged often in the interviews. On the other hand, standardization in a global organization can prove to be challenging according to the view at Omega:

> *"Automation, what it requires is standardization and when you're in a decentralized environment, it's a bit more difficult…. One size doesn't fit all in this kind of global operation like ours, so you have to split it up a bit and maybe handle these mature European markets a bit differently, the digitalization opportunity and how RPA is taken use of, it's a bit different*

> *here in Europe than it is in Asia, and so forth." (Head of Finance Development & SSC, Omega)*

Of the two previous quotes, the first refers to harmonization and the second to standardization. These words are sometimes used rather interchangeably to mean the same thing. However, one interviewee was of the opinion that harmonization of processes isn't a requirement for automation:

> *"With robotics…the idea is that you can kind of pick out the things that are done in different systems and do them smarter. You don't have to harmonize them in order to automate." (Finance Development Director, Zeta)*

Without taking stance to whether harmonization or standardization are required for automation, it does make sense to do either one of these or both to draw the maximum amount of benefit from RPA. The details then depend on how the company has decided to organize its operations e.g. between a more centralized or decentralized model.

At Beta, the SSC based its operations on harmonization to create global processes as much as possible. Because of this, the SSC was also seen as very good ground for RPA use as reaching scale was easier.

> *"…in the Service Center environment we have a principle that we have global harmonized processes, so this obviously helps and actually this is a prerequisite for doing this [using RPA] at a larger scale." (Manager, SSC, Beta)*

In standardization of processes, the devil is in the details. This was recognized at the more mature RPA operations in the Service Business Unit of Alpha. The unit had already 130 robots in production which is a significant amount compared to the support functions of any of the studied companies. At this scale of operations, a certain level of standardization becomes paramount if the efficiency benefits are to be maintained. The solution was to have a library of reusable, standardized RPA modules which could then be developed further by adding customizations to create new uses for RPA. This solution enabled a certain level of standardization while at the same time improving responsiveness to changes. Driving reuse with robotics libraries is very much what Lacity and Willcocks (2016b) recommend as well.

> *"One realization was that while, if you look on a process level, we have 7 levels of processing steps in Alpha and the lowest level is of course the working instruction and even keystroke-level definition of a process, so while*

> *on level 5 you have the process steps already fine and the processes look standard, when you go to different projects, it turns out that you have still a level of customization which is then making it difficult to reuse the robot one-to-one. So you always need to customize to the project needs and what we have done is to build a software library with reusable modules, so we are driving reuse through that, but it's always a combination of taking the module which is available and then building from those modules the robot as much as possible, but some customizations typically are still needed." (Head of Service Unit Processes and Robotics, Alpha)*

At Alpha, the reporting data models and master data differed between business units. This was a result of the fragmented systems landscape and an issue especially for financial reporting. There were several ERP environments with differing data models and so group-level reporting proved to be difficult as different manual maneuvers were required to retract all the necessary data from systems and report them in a harmonized way. In the long- or medium-term, the plan was to renew and harmonize the data models and processes across the company by e.g. transitioning to a common SAP system. In the meantime, the possibility was being investigated to use RPA in running the reports in different systems to move staff to more value-adding tasks. Here, RPA presented itself as a temporary solution for bridging the gap between poorly integrated systems.

In contrast, Beta had less problems with its ERP environment as it had a very high amount of SAP modules in use meaning that processes could be ran end-to-end within SAP. This meant less RPA to be used for patching up fragmented systems. As the opportunities with SAP had been quite well exploited already, decisions on RPA use were possibly easier to make where the capabilities of SAP ended.

The temporary nature of RPA was also noted elsewhere. The problem with legacy systems dictating what organizations can and cannot do is familiar in any larger company. At Delta, the Head of Robotics wanted to highlight the necessity of other means of development and the technological progress in other areas as well. So-called Application Programming Interfaces (APIs), which help in integrating different IT systems, have become more commonplace. This progress needs to be understood when making decisions about RPA use especially in the longer term to avoid technological lock-in.

> *"RPA is after all always a temporary solution, I think that's the most important, if you think about an organization, to understand that it's just a tool no matter how trendy, that it's applicable to some things, but it's not worthwhile to do everything with it, so if you forget about other types of development from the toolkit then I think you're lost…. With RPA you can*

> *temporarily fix the mistakes that have been done with IT which is the siloing of systems. That's the old mode of operations, now the new modern mode is that for everything you have that API with which you can do things easily and faster, but this [RPA] is this kind of temporary glue of the old world, you could say." (Head of Robotics, Delta)*

Continuous improvement was believed to be important in process reengineering at Omega. The company had not yet developed a systematic approach for developing RPA, but this planning was now progressing as the idea was to reach an industrial scale of RPA operations quickly.

> *"And what about continuous improvement…I believe, that when there's a process somewhere for which we're utilizing robotics, that it's not done only once, but we keep always returning to it, because you don't get that 100% [automated] right at first, so can you then by changing something in the master data or in how the process works, how do you raise that automation percentage continuously." (Head of Finance Development & SSC, Omega)*

In addition to Business Process Redesign, also other methods popular in the operations management world were identified as key in getting the most out of RPA. These were lean manufacturing and the Kaizen method (continuous improvement). In addition, DevOps and agile ways of working were mentioned. All of these methods have gained popularity in the software engineering and development professions in recent years. As they have an impact on how RPA is implemented in companies, it is important to take a closer look at these findings.

So-called leaning of processes was used at the studied companies in their redesign efforts to eliminate unnecessary steps in the process. The idea stems from lean manufacturing where the aim is to eliminate waste from processes. At Delta, lean methods were used for improving processes and RPA would be used as one tool in the new and improved process if it was seen as the best fit.

> *"Leaning processes, I'm not a lean expert myself…but in practice we use lean methods to evaluate the process efficiency and try to find the waiting times, so there the times when nothing is done, but the process is at a standstill, and those are aimed to be eliminated from the process and there are different methods for that…" (Head of Robotics, Delta)*

At Alpha, as the Service Business Unit had RPA working closer to the customer, also customer expectations sometimes prohibited lean methods and standardization from being applied.

> *"…one thing we have watched out for is that we don't automate crap, so if a process step is not needed or it's fully not efficient, then we try to eliminate that…it would be nice to standardize everything, to lean everything and after that automate, but what the practice shows that you're not always able to do this and typically the reasons for this are that…our project deliveries are so much tied in with our customers, that we have also some external constraints in our processes…so if your customer says in Japan that you have to do seven quality checks, even if you're convinced that maybe one would be enough, you still have to do that, because it's a customer requirement." (Head of Service Unit Processes and Robotics, Alpha)*

Regarding DevOps and agile project management methods, at Alpha, the Vice President of Finance Processes and Systems thought that the finance function should learn implementation skills from the product development organization as they were more versed in these skills. These skills were supposedly important also in RPA implementation.

> *"We have strong experience from this traditional waterfall project management. We don't have a very clear picture within finance of this DevOps stuff or agile. And DevOps and agile are our product development's…over there they are damn good at it." (Vice President, Finance Processes and Systems, Alpha)*

The interviewees with already more experience under their belts in implementing RPA highlighted the need for the process to be stable before automation. Automating a constantly changing process means chasing a moving target which obviously is not optimal. The Head of Service Unit Processes and Robotics at Alpha highlighted the stability of processes as a prerequisite for automation. In addition, also others had similar requirements:

> *"…if the process is leaned, i.e. changed…it's done before we start modeling the process, so we don't want to start modeling a kind of living situation where the process is changing, because it means, one-to-one, that we need to change the robot." (Head of Robotics, Delta)*

> *"Then there's maybe this kind of process maturity that if there are a lot of changes or the process is still seeking its form a bit then it's maybe not a potential one for this [RPA], but…if we see that it [the process] is either fairly stable or it's stabilizing then that's one thing we look at [as criteria for robotizing a process]." (Head of Finance Development & SSC, Omega)*

5.4 Benefits of RPA

The benefits identified at the studied companies were largely the same as what has been identified in the extant, but limited, literature. However, the following paragraphs also aid

in illuminating the different sides of the benefits and their value in relation to each other. A longer list of benefits could probably be listed if split into smaller components, but this study finds that benefits of RPA are somewhat overlapping, they could be categorized in different ways and, also, companies are in any case evaluating these benefits as a whole, and, what's more, also the benefits of other options and technologies. Hence, the choice was made in this section to use a more simplistic, high-level categorization, but to then introduce more detail with the help of interview findings.

5.4.1 FTE and time savings

All companies viewed savings in full-time equivalent (FTE) employees as an incentive in implementing RPA. What is important to note is, however, that these savings do not directly translate into bottom line cost savings. Often, the value is derived from the freeing up of human resources to deploy them in more value-adding activities.

> *"There are enormous amounts of benefits. There are all kinds and there are these FTE and cost saving benefits, but for example at the Service Center we've aimed at taking on board more work. What we sought for with robotics, when we started out, was exactly to take more work in to the Service Center, but also to have people start doing more of this kind of value-adding and innovative work." (Vice President, Treasury & Financial Shared Services, Beta)*

> *"We do aim to measure…how much we got people away from a process in a full-time equivalent sense…. That's the starting point, because it's a different question then, that does the person go to another task or out the door. That's a different discussion then." (Vice President, Finance Processes and Systems, Alpha)*

> *"…out there in the SSC world FTE is one of the basic metrics so we do look at how many FTEs work this is, the scale." (Head of Finance Development & SSC, Omega)*

Instead of FTE savings, this benefit could also be called time savings as often headcount was not reduced due to robotization of processes. What RPA enabled was actually to shift resources to other tasks in order to also broaden the scope of activities of functions. The Manager of Cash Management in the treasury department at Beta commented that the treasury was able to automate a lot of reporting through RPA and elaborated:

> *"So then the robot takes care of it [preparing the report], so in practice the data is always up to date without requiring any action and actually that's a pretty big scope enlargement for us. It's not just that we can maybe automate*

> *the existing report, but actually our ability to follow all things and phenomena relating to the scope of treasury is far broader than ever before, because we don't have to do it ourselves. The robot retrieves the data, updates it into the database and this visualization tool is also updated in real time, so you only have to look it over that 'okay, this is what our figures look like' and if there is anything that requires reacting to." (Manager, Cash Management, Beta)*

FTE savings sometimes also affected the external personnel (like suppliers and consultants) more than the internal, so savings could be reached without reducing the company's own personnel.

> *"Actually we haven't had to reduce many [human] resources at Delta because of these robots, but we have gained more sales, so there's new type of work for these people and on the other hand we've been able to reduce [external] sourcing." (Head of Robotics, Delta)*

The fact that the companies had already outsourced or offshored a lot of their routine work to lower cost countries (India being among the most popular options) meant that the cost saving opportunity resulting from FTE reductions was not always compelling. Automating processes in developed countries where costs of labor are higher was seen as a clearer opportunity in monetary terms.

> *"The cost benefit from transferring work from a high cost country to India against automating in a high cost country: the saving isn't the first thing." (Head of Finance Development & SSC, Omega)*

5.4.2 Quality improvements

In addition to FTE and cost savings, improved quality was an important identified benefit by the interviewees. A software bot performs the actions in the same way every time, so assuming that it has been programmed correctly it does not make errors. As especially the outsourced and offshored tasks didn't always provide enough upside in terms of cost savings, other benefits may be needed to complement and improve the business case.

> *"Maybe also quality in a way [is a benefit], that how important is it to remove the human errors from there [the process], because that's what the robots are good at, they don't make human errors." (Head of Finance Development & SSC, Omega)*

The SSC at Beta was faced with expectations of increasing internal controls, monitoring and reporting to ensure quality. RPA was seen as a solution to be able to complete these additional requests.

> *"…we've started to build the RPA for these, so tasks which we have never even done before, but which we are supposed to do. So we kind of haven't had the time to do [them before]…" (Manager, SSC, Beta)*

Improved quality doesn't manifest itself only in processes free of errors; it can also be visible in the level of service. As the RPA capacity can be available more flexibly than human resources, tasks can also be run on a different schedule than when they were performed by people. On the prioritization of cost savings against quality benefits, the Head of Finance Development & SSC at Omega commented that automated processes reduce the problem with turnover of personnel at the SSC which can have an impact on the quality of the SSC's services:

> *"…the saving isn't the first thing. Sure some of that is also gained, but I see more that it comes through quality…and typically in these tasks which are very routine-based, there's quite high turnover in personnel which is a type of cost and quality issue for us, so it [the benefit] comes more from there." (Head of Finance Development & SSC, Omega)*

5.4.3 Employee engagement and satisfaction

Even though RPA can potentially eliminate some jobs or parts of them, causing distress for employees, also positive impacts were noted on the engagement of employees and job satisfaction. First of all, RPA is used to automate the most routine, recurring and mundane tasks reducing the necessity to make people perform these while at the same time opening up the opportunity to move people to more interesting roles.

> *"…this [RPA] is also a big motivational factor…that people can innovate what opportunities exist to improve processes or automate them and it truly is a motivational factor…. When robotics is covered in the public sphere it is partly considered also as a threat that thousands of jobs will disappear and this and that will disappear, but over here not a single person has been fired as a result of making these robots, because this just frees up time from those mechanic, boring tasks so you can really check those figures several times, understand where they come from, what affected them, what needs to be done." (Manager, Cash Management, Beta)*

> *"They [the employees] are usually pretty happy about getting rid of the repetitive, boring tasks. In general, it's like this." (Head of Robotics, Delta)*

> *"We have for example a SSC which prepares every month about 1600 different reports and does it fairly manually, so that's one area we've started to look at…and if we could now automate them [the reports] to get people away from the so-called digging work." (Vice President, Finance Processes and Systems, Alpha)*

Second, RPA can work more flexibly at any hour making it possible to plan the work of people according to a more regular schedule. Such was the case at Omega with their first use case of report generation (presented earlier) where several people at the SSC in India had to go to work every Sunday to manually prepare the report. This reporting task was automated with RPA and the employees were freed of the need to go to work on Sundays.

Third, as RPA by its nature usually requires detailed understanding of the processes to be automated, employees closer to the process (i.e. the subject matter experts) often need to be engaged in the automation effort. At best, this can empower these employees to start solving some of their problems at work through automation as it doesn't any longer require as heavy involvement from IT as previously with other technologies more reliant on software programming.

> *"...people start innovating more when they understand what can be done with the robots. So they've started to see a lot of opportunities." (Vice President, Treasury & Financial Shared Services, Beta)*

Fourth, robotics can be a fascinating and futuristic concept to some employees who are interested in staying on top of the latest technologies. The hype of digital technologies and artificial intelligence has surely reached some employees making them more eager to adopt these technologies in their work. In a nutshell, learning new skills can be motivating.

> *"It's a bit that after all, about automation, that taking use of technology is talked about quite a lot, no one wants to be a dinosaur." (Head of Finance Development & SSC, Omega)*

> *"...then also employee satisfaction [is a benefit of RPA], so we get to learn new things and get rid of the boring tasks." (Head of Robotics, Delta)*

5.4.4 Speed increases

RPA has a tendency to improve the speed of service delivery. Based on the interviews, RPA improves speed in two ways: it usually performs the reengineered process faster than a human and it can operate non-stop. As RPA works through the presentation layer in systems the same way as humans, it's not a given that it completes processes faster than people. However, since its way of working is methodical and consistent and the redesigned process is usually also smarter than the old one, it can be argued that a redesigned process with a software bot is faster than a human performing the old process. That said, the real

benefit in speed results from the possibility to work the software bot continuously without the breaks that a human would need.

> *"FTE is if we measure basically the equivalent of a human capacity we are freeing up with our productive robots and in a theoretical approach you can have one robot replacing three FTEs, because of course one human is working 8 hours, one robot is working 24 hours and then even if you mimic the human user in terms of speed in operations you can work three time more with the robot per day." (Head of Service Unit Processes and Robotics, Alpha)*

The above quote touches actually on benefits in terms of FTE savings as well as service quality and speed. This shows how interrelated benefits can be and so any business case should include a comprehensive evaluation of the attainable benefits.

5.4.5 Shorter lead times

RPA capacity is more flexible than human resources and so can be used to perform work at odd hours and on demand. This has the benefit of improving lead times of processes. The earlier introduced use case at Omega of inputting information into customer systems is a good example of shortening lead times.

> *"…first and foremost…lead times, that when something happens we get it immediately. It doesn't pile up somewhere in queues, so that someone then at the end of the workday types them in. That's maybe the most significant, that we are able to serve our customers better." (Head of Finance Development & SSC, Omega)*

Delta was also able to reduce lead times, e.g. in their process of granting and paying student loans:

> *"…let's take for example a student loan offer…. In practice it [RPA] performs the task in a fraction of the time compared to before, so the customer promise, customer experience is strongly present there. …when the application arrives in the online bank, we get it for processing the following day and then it's already paid with a delay of one day, so there we've saved time." (Head of Robotics, Delta)*

The previous two examples both also underline how shortened lead times can have a positive impact on customer service.

5.4.6 Improved customer experience/service

The already listed benefits could indirectly all have an impact on the customer experience. It is still beneficial to separately highlight the possible direct benefits to the customer experience which RPA can offer. As was already pointed out earlier in a use case from Delta, customer-facing operations can bring in front-office robotics to their customer services so that clerks can focus better on interacting with the customer while RPA does some of the keying of input into different systems, opening customer accounts and so on.

5.4.7 Drives process redesign

A more general benefit of RPA found in this study is the redesign of processes that RPA brings about. Because of its rules-based logic, RPA introduces standards also where they earlier might not have existed. In a way, RPA forces process thinking on the organization. This impact of RPA driving process redesign was noted in the frequent mentions of e.g. leaning and standardizing processes. Also continuous improvement was emphasized implying that the impact of RPA inducing process development efforts was more permanent.

Naturally, some processes are already recognized as such, long before the advent of RPA. These processes have then been optimized relatively far during earlier initiatives. However, the beauty of RPA as a new general purpose technology is that it can work in so many different domains that it may transfer process thinking also to areas where this type of thinking has not been as customary.

5.5 Challenges of RPA

Several challenges facing RPA adoption were identified. The studied companies were in different stages of maturity with their RPA operations which helped gain a more comprehensive view of the challenges in the different phases of developing the capability. This section will take a somewhat chronological approach as some challenges arise more typically in the beginning and others at the more advanced stages of the RPA journey. The order of topics here is, however, only a rough approximation and doesn’t aim at introducing a RPA development maturity model of any sort.

5.5.1 Setup of IT infrastructure

Involving the IT function early on is important as it is typically needed in setting up the infrastructure. IT involvement is important also to evaluate possible technical vulnerabilities and risks. However, in large organizations, the speed at which IT can respond to these needs can sometimes be inadequate from the operations point of view.

> *"Then the other challenge came on the IT requirements and infrastructure requirements of the robots, so we have decided to use the cloud, the Alpha private cloud for the robots and, of course, to build up this capacity in the cloud it took us, or took our IT department a bit longer than expected. So it was about actually 6 months until they could build up that capacity what we requested from them." (Head of Service Unit Processes and Robotics, Alpha)*

Similar challenges were noted at Zeta although here relating to another automation tool for SAP specifically (not as general purpose as RPA):

> *"Of course there's always that, if you need to include IT, since it's no longer in-house. There we noticed at times that, is it [Outsourcing Partner 1 or 2] that is in charge of this. So there were some small question marks. And we did notice that we could have progressed faster at times, but we had to wait for IT, and I believe that it's quite a typical [challenge]. Then again it's good, that once IT had installed it [the system] then in practice the whole building of the tool itself was driven by finance." (Finance Development Manager, Zeta)*

The role between the functions and IT was different between the companies, but the tendency was that the functions implementing RPA wanted to have the control at their end. IT was to provide the infrastructure in one way or another, but the rest would then be up to the functions themselves to direct.

> *"We've done this from the very beginning in good cooperation with IT, but this, IT can't do this by themselves, so maybe more the roles go in this way that: if you think that you have the laptop there in front of you, then those things which happen behind the screen, they are IT, and those which happen in front of the screen, they are [for] the SSC and in robotics it's about us automating that work which is in front of the screen, so in that sense the setup is quite natural here. So IT offers us the platform and makes sure that we have the technological capability in place…[e.g.] such practical things as how are the robot user IDs managed. These kinds of things they look at also, but then how we develop the processes and how the robotics is used to drive the process, that has then been more the role of us SSC-people." (Head of Finance Development & SSC, Omega)*

5.5.2 Finding scalable opportunities

Companies also found it challenging to decide on where to focus. Where would the best opportunities be found providing superior return on investment? Best practices, with a new technology such as RPA, had not been established and so some things had to be learned through trial and error. Some rules-based, routine processes are fairly obvious candidates for automation, but do they offer benefits at a larger scale?

> *"…the key challenges was, beside technical difficulties, also to get the right focus on those opportunities which really are, let's say scalable and heavy volumes, to build the robotics, because our ambition is to have a better than one year return on investment and we built the transformation methodology fitting to the robotic process automation life cycle, including the opportunity identification, but also the business benefits realization, basically getting commitment from the business and operations owners to realize the benefit at the time we decide to invest in a certain robot. And while the initial estimates were actually more ambitious across the different service domains, now we see it a bit more realistically what is achievable." (Head of Service Unit Processes and Robotics, Alpha)*

> *"The challenges might come from how we are able to capitalize on the scale, in this world of ours, since this [operating model] is so decentralized and we're not 100% standardized in everything…it doesn't prevent robotics, it's more just that we don't get that leverage from there as much as would be possible." (Head of Finance Development & SSC, Omega)*

There were also signs that some external service providers are able to give some guidance on the typical opportunities, which implies that best practices are gradually forming:

> *"…now the first service providers are emerging, who…arrive with this complete list, that they've seen at previous clients that these could be the opportunities, maybe these could work for you too." (Head of Finance Development & SSC, Omega)*

Relating strongly to the challenge of finding scalable opportunities are the other solutions available for streamlining or automating processes. The earlier literature review noted how RPA is used for processes where traditional software development is not applicable (Lacity and Willcocks, 2016a); implying that software development is a more robust solution involving programming and RPA is then the cheaper and more agile solution. The challenge might then be about how to find the sweet spot for scale with RPA when there are better solutions for automating the highest volume recurring processes.

As noted earlier, the companies were developing their systems continuously in any case. Upgrades of legacy systems might bring about new automation capabilities rendering RPA

useless or something close to it. With all these changes on-going, it is necessary to treat RPA as a temporary solution. This view came across in the interviews also:

> *"…robots aren't in my opinion viable, it's not even viable to make them last forever. Instead, I see it like this, that we need to make these business cases for half a year, that if you can do it in a way that it has paid itself back in half a year, then it's worthwhile to do it, because then if it's needed to be replaced in a year, then what? So kind of, with all of this we should shorten the time to impact to as short as possible to get the benefits in, because Omega is a growing and developing company, so this world [the company environment] is changing all the time, so the robots, they're kind of disposable stuff anyway. That's also a type of difference in paradigm compared to traditional IT-systems that the traditional IT-systems are built in a way that they're eternal, whereas these [robots], they don't have to be. They need to be durable, so you can live with them, but you don't have to make them eternal." (Head of Finance Development & SSC, Omega)*

The literature, RPA service providers and consultancies as well as the empirical findings here emphasize the need to focus RPA on what has been called the long tail of change, i.e. the significant amount of smaller change requirements directed at IT which it can never completely deliver on. The general rule is very simple: use systems development for processes requiring plenty of IT involvement and high technology investment, use RPA where processes require plenty of specific process expertise and lower technology investment. In practice, however, there is a grey area in between which is not clear-cut:

> *"…actually we had a case not many weeks ago…trying to do with RPA this gathering of information, this enormous amount of data, and it just didn't work and then it was concluded that it requires traditional IT system development…" (Head of Finance Development & SSC, Omega)*

5.5.3 Communicating the vision

Creating an organizational RPA capability requires involving people also closer to the business processes in order to recognize automation opportunities and possibly help in the redesign of processes. Spreading the word and involving the personnel requires efficient communication. As some of the interviewees were in the early stages of building this capability in their unit or company, succeeding in the communication in an impactful way was recognized as a possible challenge.

> *"The first challenge is that you can create the positive image [of RPA] and that's not difficult, because there's quite a bit of hype in the market and that in a way helps there, but making it concrete in the context of our own personnel, that's maybe the big thing. To make them understand that 'okay,*

this is actually relevant for me'." (Vice President, Finance Processes and Systems, Alpha)

"...I believe that in the future automating one's own work will be a core competence, so then how do we spread this, that...everyone would start to recognize these process automation opportunities." (Head of Finance Development & SSC, Omega)

5.5.4 Resource scarcity

The goal of business process automation is to improve efficiency and, in so doing, to drive down costs. On the other hand, an organizational RPA capability cannot be built from scratch without incurring some costs. Added pressure is introduced from a type of short-termism underlying RPA and which has been referred to in the earlier sections. The expected payback time of RPA investments is usually very short, often measured in months rather than years.

As a result, to have a viable business case, resource allocation to the RPA effort needs to be carefully thought out. In addition, the process-specific experts needed for automation may be all over the organization and they are usually tied up in the day-to-day operations. As an example, Alpha had an ambitious cost saving target to deliver in the short term and so additional resources for development were hard to come by:

"Our challenge is that our resources are such that they are involved in several projects simultaneously, so we have very few projects with full-time dedicated resources…. There what we have thought is that we should really, truly break loose resources in this organization which we can take away from operations work so they can concentrate specifically e.g. on this improvement of process and automation of it and then bringing a certain technology there on top of it." (Vice President, Finance Processes and Systems, Alpha)

5.5.5 IT system landscape

The importance of harmonizing or rationalizing systems was earlier touched on in brief. This may be in some cases a prerequisite for gaining benefits of the more ambitious scale. The need for process redesign has also been emphasized in the previous chapters. Likewise, the role of IT systems involved in the process may require some redesign. A few examples could be, as is often the case in large corporations, too many, outdated or poorly integrated systems. A scattered system landscape does not prevent robotics, but it does imply that a higher amount of individual processes need to be configured for the software bot to run all of them.

> *"There are systems where we are not allowed for licensing reasons to make robots i.e. the terms of the license are made for humans and it's forbidden, it's not possible to do. Then there are also programs which simply can't be robotized because of how the systems have been made." (Head of Robotics, Delta)*

> *"…then there are technical problems. The system may simply be so slow that it's just not...sensible, so the user interface is, the world is full of poorly made systems, so we struggle with those quite a lot." (Head of Robotics, Delta)*

> *"In our organization I would say that always change management is a big area of attention and I am a bit worried about the scattered system landscape, so how can we really utilize robotics, RPA to the full extent, knowing our system landscape." (Vice President, Group Finance & Control, Zeta)*

Again, a balance needs to be struck, because the short lifecycle of the robotized processes needs to be accounted for. Hence, very heavy systems rationalization is not necessarily required for RPA, because after a certain point other solutions (like developing the ERP system further) could provide more benefit.

5.5.6 Managing dependencies

As mentioned previously, the service unit at Alpha was further along in their RPA operations. As their operations were scaling fast and had reached 130 software bots in production, an important issue became how to manage the dependencies between several moving parts in several development projects all at the same time. Dependencies included dealing with both internal (e.g. IT department) as well as external (e.g. the customers) stakeholders to ensure that everything was progressing on schedule and tasks were completed timely in relation to each other. IT-related dependencies could be e.g. managing firewall settings and user accounts while customer-related dependencies could involve aligning on quality assurance, protection from errors and data security in the robotics platform. The robots were developed at a fast pace through so-called robotics sprints.

> *"So getting back to the challenges, managing dependencies is key and if you have, let's say, 20 robotics sprints under development, then each sprint has about 10 or more dependencies then it's about 200 parts dependencies you have to manage in your project at the same time…" (Head of Service Unit Processes and Robotics, Alpha)*

As Beta was relatively far ahead in its RPA journey, it also experienced first-hand the need to manage dependencies between RPA, processes and the related systems:

"…for us it [RPA maintenance] is a challenge…. Now if you have an update in the underlying systems, then you always have to check that the robot still works…so it means that we need to be able to maintain…the information, that this robot uses these systems in this process, and so forth." (Vice President, Treasury & Financial Shared Services, Beta)

5.5.7 Creating end-to-end processes

Relating somewhat to the earlier presented challenge of finding scalable opportunities is the challenge of creating end-to-end processes, i.e. bridging possible gaps to ensure that processes span their maximum length in an efficient manner. The issue relates to the challenge of reaching scale because, in addition to automating more processes, a positive impact could be made also by automating longer processes reaching across functional boundaries. This may in a sense be a challenge especially as some degree of maturity is reached and the organization has practiced with the tool and gained some more experience of its capabilities and is ready to take the next step.

"What I would see as a development area is that there would be this end-to-end thinking. So now, when RPA use has spread to the business, that we would have this end-to-end coordination in order to have complete processes [automated]. Now of course everyone is focused more on their own activities and processes, but little by little we've tried to shift…at least on our part we've discussed for example with procurement if we could do something together to get the whole end-to-end chain within the scope of RPA. So that's also a kind of challenge." (Manager, SSC, Beta)

5.6 Capability development

As mentioned earlier, RPA had not yet been widely adopted in the companies and so also building of the capability for RPA was still in progress. In the following, some key findings in the companies' capability development efforts will be brought to light.

5.6.1 Required resources

In terms of technology, the companies were using mainly the big three RPA vendors currently available. These are Blue Prism, UiPath and Automation Anywhere. Their software differ somewhat e.g. in whether they are more suitable for larger volume batch runs requiring software development skills (Blue Prism and Automation Anywhere) or more intuitive and user friendly towards personnel not versed in programming (UiPath).

As a result, the choice of technology very much determines who the end-user will be and whether the automation effort might be more in the hands of IT or business personnel. Different choices had been made at the studied companies regarding this and some were still undecided. Beta had decided to involve the employees with business/functional expertise. A selected group of personnel were involved in workshops with each RPA vendor in testing the systems with the same chosen processes:

> *"We had three different options [for RPA vendor] and with each of these vendors we held a two-day workshop." (Vice President, Treasury & Financial Shared Services, Beta)*

> *"All vendors were tested and then the hands-on solved it, so we listened to the people in the team who participated, we did a pros and cons…and then user friendliness was one of the most important criteria." (Manager, SSC, Beta)*

Another question worth considering was which vendors would survive in the long run with the market for RPA solutions still being relatively immature:

> *"…we've also tried to look at which one of these robotics vendors will survive, so that's also something to consider that it will exist still in two years' time…" (Vice President, Treasury & Financial Shared Services, Beta)*

> *"We're right now evaluating whether we should do a more strategic choice between these bigger vendors. I've approached it in such a way that this is so new and an immature area that no matter what technology we choose now it will likely be the wrong one in three years, so this market will consolidate…. And it's interesting to see what these big software vendors like SAP will do. Will it buy one of these or what will it do?" (Head of Finance Development & SSC, Omega)*

Some of the companies were using more than one vendor. The reasons behind this were that the technical capabilities of the RPA software differed to some extent and also to avoid the risk of possibly choosing the wrong vendor in a dynamic market.

As for human resources, both IT as well as business/functional personnel are needed in the effort to have both the technical as well as the process knowledge available. As mentioned, some RPA software requires more software development knowledge. This should be recognized as it impacts e.g. questions of RPA ownership and where the capability is built. In any case, business and functional experts are needed to map out the processes, but they can be involved in actually also programming the software if it is easy to use. Out of the

studied companies, Beta had ended up using UiPath and was experiencing great success with having its own people close to processes building the bots.

5.6.2 Dedicated function

In large organizations like the companies in this study, a key question is where the RPA capability should be located. Most probably the capability as a whole cannot be said to reside in any one place, but still there may be an identifiable locus. Knowledge sharing by way of communication and training was taking place to distribute the capability within the organization to those who were needed in the development effort. Still, the companies had usually decided (or contemplated) on also building a centralized function having ownership of RPA expertise and development in the organization. This is akin to the recommendation by Lacity and Willcocks (2016b) to establish a command center.

This function was commonly going by the name of a Center of Excellence or Center of Expertise (CoE). The CoE was often located at centralized IT, but not in all cases. The headcount of the CoE depended on its more specific responsibilities as these could range from RPA to other types of process development as well as towards development of artificial intelligence. The CoE was typically responsible for e.g. the development and maintenance of the robots, so usually the team consisted of people with a technical background. It could also be responsible for knowledge sharing efforts and in this way fulfilling the role of a functional solution for enhancing learning (Heimeriks et al., 2009):

> *"…actually we have also widely trained our service community, so while we have started with a more centralized approach where our Center of Expertise has driven the stages, we try to distribute this knowledge more and more in the organization that people are able to identify opportunities and qualify opportunities themselves and then come up with a valid idea ready and then the development that is coming still mostly centrally, but then this kind of identification and even some of the architecture knowledge…we actually train more than 100 people across the different delivery units in services to penetrate and distribute this knowledge." (Head of Service Unit Processes and Robotics, Alpha)*

It was rather clear that ownership of the processes themselves was to be retained at the business or functions despite the existence of a CoE. The role of the CoE in initiating automation depended partly on whether the business or functions had the programming knowledge at their end. Functions with their own RPA capability consisting of a few people experienced in RPA programming were able to sustain themselves more easily with

less help from a CoE. This was the case at Beta where the SSC had a headcount of two internal resources able to robotize processes.

5.6.3 Internal vs. external capability

Generally, the companies wanted to build the capability in-house meaning that the make or buy decision (see e.g. Maritan and Peteraf, 2011) was here leaning towards the former. External service providers were used especially in the beginning to initially assess opportunities and develop the software bots, but as time progressed, the more critical competences were to be located internal to the organization. The role of external partners was more to then provide flexibility to scale up the operations when needed.

> *"More and more we aim to form the technical ownership of this thing and subcontractors or partners are then used e.g. for increasing modeling capacity, for scaling it up, mainly. And then there are these more strategic partnerships…they have this maintenance of the [system] environment also." (Head of Robotics, Delta)*

Alpha had at its Service Unit, in fact, started out by giving its external partner a more central role, but had then come to the conclusion to shift the operations more in-house:

> *"I mean, if I look back on that phase, while [the external partner] has been bringing in some relevant competence on robotic process automation, they were absolutely lacking the understanding and competence on our service business and processes, so have been quite much, you know, it was a quite steep learning we had to do, let's put it that way. And the speed of the implementation of the first pilots and the scale-up didn't exactly match our expectations, so we have been also deciding somewhere at the beginning of last year, so about one year ago, that we discontinue that…cooperation [with the external partner]. We take the end-to-end program management of the robotic process automation initiative on [our] side and also that we will have, you know, an in-house capability then complemented with also some other partners, but especially, you know, the architect-type of competence, technical project management competences we have mostly internalized and then giving our subcontracting partners more like work package assignments on the development of our robot." (Head of Service Unit Processes and Robotics, Alpha)*

In addition to deciding on make or buy questions, companies had to decide where to locate the capability internally within the organization. The finance organization at Alpha was organizing what were called funnel workshops with the different process owners where ideas for use cases could be discussed for each process area. The RPA software platform was being discussed with the IT department with first initial options having been very

recently presented. Various options existed from the possibility to use the existing platforms of other units which were further in their RPA development to building their own platform from scratch and then either having IT providing only the platform (i.e. the infrastructure) or, alternatively, also a full RPA as a service (including e.g. maintenance and scripting). The IT department also was hoping to eventually build a common company-wide RPA platform. When asked about this plan from the Service Unit's Head of Processes and Robotics, he replied:

> *"When we made this operative decision to start this journey of RPA…the requirement was that it has to be quick in reacting to the business needs and so much tied into our business operations that we have decided to build it within the Service Unit. Honestly, I think it's the right decision, because with the best intent of IT, I don't think they are able to get that close to our business that they can react with this 'weeks of cycle time'-requirement. On the other hand, of course, we should look on the whole architecture and platform are matching and we have worked from the beginning with IT to define the cloud architecture, the virtual machines to fully fit into the IT environment and in that sense I think that's the way to follow." (Head of Service Unit Processes and Robotics, Alpha)*

In other words, the Head of Processes and Robotics implied that planning and cooperation with IT was important, but control was to be kept closer to the operations to ensure excellent service delivery.

Beta had built its own capability internally from the beginning and was a strong advocate of this approach. What was peculiar about Beta as a large corporation was that its SSC was located in Finland and consisted of internal personnel and also the RPA capability had been mostly (excluding some benchmarking in the beginning by consultants) built internally. This enabled strong control of the end-result and resulted in fewer errors.

At Beta, the biggest problems the interviewees had seen other companies facing was in having externals programming the software bots which resulted in lost efficiency as more effort was needed for the external developers to understand the processes they were automating. The same difficulty was partially also seen in having internal IT develop the robots. In addition, the possibly high turnover of externals was seen as a risk and the possibility to have internal personnel commit themselves to the cause more easily was seen as an advantage.

> *"…the idea here is that everyone can make [robots] and that's why I always say that the best programmer is the one who knows these processes, so that's*

> *why we have started to move it forward in this way. In many other companies you either take an external to do this, and we've never used an external consultant to do this, and then the other way is that you just have IT people who start making these robots, but you always have the problem that those people don't know the processes, so you have to use a tremendous amount of time on corrections." (Vice President, Treasury & Financial Shared Services, Beta)*

At Omega, the interviewees weren't as sure that building an in-house capability was the best approach:

> *"…and then there's also that, what we have in-house versus what we will purchase outside [of the company], Omega's traditional approach would be that we build the capability primarily for ourselves and it can be reasonable here also, but maybe I would challenge that too, that this is such a rapidly changing world that how could we also take use of external innovation…to get best practice from other companies here." (Head of Finance Development & SSC, Omega)*

> *"My view is that we will use third parties quite a lot in these robotizations as it's not our core business here so that we would start to learn it ourselves." (Director, Global Process Owner for Finance, Omega)*

Omega was not yet very far in its endeavor with RPA and the above quote may reflect to some extent the urgency felt at the company to scale up RPA operations while at the same time not being sure which road to take. Thus, using external partners with best practice knowledge could help reduce uncertainty.

5.6.4 Opportunity identification

Identifying the opportunities for RPA usage had proven to be no simple task for the companies. Especially in a larger organization – with RPA being a general purpose technology – the opportunities can be seemingly everywhere. As mentioned, the initial approach to RPA was experimental, and so was the initial approach to identifying the opportunities. Informal brainstorming was favored and the first use cases were found by choosing processes for automation by simple criteria such as by their rules-based nature or large transaction volumes. This resembles the high-impact approach to identification of processes for process redesign proposed by Davenport and Short (1990) where only the processes with the most impact are chosen for redesign.

> *"In good cooperation with IT we just started to experiment with it [RPA] a year and a half ago…. It started from report generation, so we had this weekly generated report which was earlier done in such a way that we had, a little depending on the team, 4-8 people going to work every Sunday in India*

> *and it took up to 10 hours that they manually prepared the report. So we modified the process a little bit and that was the first [process] with a robot." (Head of Finance Development & SSC, Omega)*
>
> *"…we've started with the so-called low-hanging fruits, so the easiest, largest volumes [processes]." (Head of Robotics, Delta)*
>
> *"At the beginning we were shooting at almost everything. I think one of the challenges was that there were quite high expectations about 'okay, let's get everything robotized' and…the whole company was, including our, actually, board members were very excited and that was very good…. Of course this was creating a quite high pressure on the other hand." (Head of Service Unit Processes and Robotics, Alpha)*

It was evident that opportunity identification could not be entirely centralized since the opportunities can be widely dispersed in the organization. To gain benefits of scale, opportunities would need to be recognized also closer to the processes in the respective business and support functions. This requires that knowledge of the existence of this new tool and its capabilities are embedded in the organization more broadly. This way the people working closer to the opportunities can identify them and suggest them to be automated.

> *"Our value creation is very decentralized, so then these opportunities, they're scattered out there in the world, so I'm not sure if it's even reasonable that we would centrally over here do this type of analysis…it's maybe more that we get the organization itself, that the thoughts would flow bottom-up about what we could do and our job [at headquarters] would be more to compile those together and see what's reasonable for Omega." (Head of Finance Development & SSC, Omega)*
>
> *"It also depends a lot on how we recognize, not only the processes, but people who want to move this RPA thing forward in their own function or business." (Finance Development Director, Zeta)*
>
> *"It's irrelevant if it's a business or a function, but from there needs to come that push that 'we have these types of things [i.e. ideas for automation]'…" (Finance Development Director, Zeta)*

The aforementioned implies that the RPA capability should span the entire company and requires broad-based cooperation between units and functions. The more specific setup may, however, differ between companies. Building the required cross-functional cooperation was recognized as a possible challenge at some of the companies because of different reasons like the existence of intra-organizational silos, decentralized operations or simply because such cooperation had not thus far been imperative.

Quite soon after starting their experimentation, the companies started adopting a more methodological approach to opportunity identification. The focus was still on the processes with a relatively high volume of transactions and on time-consuming activities, but in addition, also a degree of formality has emerged which is visible as rules and governance structures. For example, rules and pre-evaluation forms (similar to tool based solutions as learning mechanisms (Heimeriks et al., 2009)) were used with questions scoping the transaction volumes, the amount of full-time equivalent labor required in the process, impact on customer experience, impact on speed and quality as well as risk and technical requirements evaluations, and so forth. These checks were used before implementing robotics to a process and can be viewed as a type of vetting of the identified opportunities. Also workshops were organized to discuss and prioritize the opportunities.

> *"Risks could include for example: how much money does the robot handle; does it make independent decisions; is it possible that there's negative publicity if the robot makes a mistake? … Then we also evaluate from a privacy perspective when we robotize that does it [the software bot] handle personal information? How does it save personal information? Can these be deleted if a customer asks for it? Another one is information security…. Then also the [IT] architecture, so is the architecture something we can live with. These different points are evaluated on quite a wide scale before we can robotize something in this industry." (Head of Robotics, Delta)*

Beta was relatively far in its robotization efforts and saw one of the keys to its success in not having a strict formal process for vetting ideas. The thinking behind this was that anyone in the organization should be allowed to try out RPA and benefit from it. Hence, vetting ideas in a very strict manner might scare people off from even trying. On the other hand, at Beta's SSC where a lot of finance processes had been robotized, some evaluation of ideas was still being done in order to set priorities as the amount of new ideas vas constantly very high.

The Head of Service Unit Processes and Robotics at Alpha also noted that with time the team had learned that a great amount of sophistication was not always needed in opportunity identification. Often just looking at what their employees are spending time on is a good gauge of where the opportunities for process automation lie. Some opportunities lie in very simple tasks like uploading large files from one system to another.

5.6.5 Learning and the role of the finance function

All of the companies were communicating and organizing training on RPA to spread the capability in the organizations. This communication and training was often organized from the CoE (in accordance with functional solutions for learning of Heimeriks et al., 2009), but also the finance function and, more specifically, the SSC organizations were spreading the word as they were in some cases ahead of the rest of the organization in developing the RPA capability.

The knowledge sharing effort spanned from more general corporate communications via e.g. the company intranet in the form of educational video clips as well as by way of more focused training sessions for end-users. The depth of the training depended on the chosen approach on whether the aim was to have the process specialists in the business and functions program the robots themselves or if this programing was the job of IT. If IT did the programming, then the training at the business and functions was usually more focused on identification of the automation opportunities to have the people near the processes generate ideas for IT.

> *"Talking about general communications, as an example, in the Delta intra we tell about robotics, for example we just did this animation video which goes to everyone at Delta: what is robotics, what does it do…creating general awareness a lot. Then we have department meetings. I often go and talk about robotics in department meetings, so this kind of more targeted…and then the presentation is always tailored a bit according to the audience.... Then we can also train staff here to identify the robotics opportunities then so that they can be managed, so it's really broad-based [communications]." (Head of Robotics, Delta)*

At Beta, the training could be more hands-on testing of the software as the aim was to have process owners themselves do programming. Even at Beta, the goal was not to have everyone capable of developing the software bots, but to find volunteers to be involved in RPA programming. The two RPA experts at the SSC were also involved a lot in transferring the knowledge across businesses and functions as they were the most experienced robotics developers. They were giving training on the RPA software, but there was also a forum for those involved in RPA development to share knowledge for newcomers.

As mentioned, the finance function and SSC were among the earlier adopters of RPA in the respective organizations. The literature has also identified these functions as suitable

ground for RPA (Suri et al., 2017) as they usually are responsible for a whole host of recurring, rules-based, processes. As the early adopters, the finance function could gain an advantage with a superior RPA capability compared to other company functions. Potential was recognized in acting as internal consultants on RPA towards the business and functions.

> *"…I'm thinking that we could act as this type of internal consultancy team as well. Sure, this process reengineering and robotics as part of it…needs to be distributed to the organization as a whole, but I feel that we could at the SSC build this kind of internal consultancy team. Because we have a significant mass of that work [suitable for RPA], so we could learn from there and bring credibility and I'm surprised if by the end of the year we don't have the first projects where we've automated something that isn't really a responsibility of the SSC." (Head of Finance Development & SSC, Omega)*

What Omega was in the above contemplating on Beta had already put into practice. As mentioned two paragraphs earlier, the SSC had been involved in spreading the word and training people on RPA across businesses and functions within the company.

At Alpha the early adopter was the Service Unit. Thus, it makes sense that in building its own capability, the finance function was closely cooperating here with the Service Unit since the Service Unit was further along in its RPA adoption. Experiences were shared and it had also been agreed that the Service Unit was to engage their RPA developers to support also finance to some extent in programming the software bots. The Service Unit saw this as a win-win as this would result in cost sharing:

> *"Makes sense of course from both sides, because we can reduce our cost per robot and finance hopefully will have an excellent service from us." (Head of Service Unit Processes and Robotics, Alpha)*

The adoption of RPA was also redefining the needed skillset in finance and shared services. Being able to complete simple routines efficiently is starting to become a requirement of the past. Understanding work in terms of processes and then being able to automate these processes are new skills recognized in this study. As technology completes more of the simpler tasks there may be more time for identifying and solving new problems.

> *"Let's take the SSC as it's easy [as an example]. This [RPA] will change the profile of what type of people we need. You can't have the type of people who want to just blast at that one and the same thing, but I think that we have quite a lot of those people who don't want that either, because they're from*

> *universities and elsewhere hired there and they probably want to do more complicated stuff, but let's say that the type of person who wants to do what's familiar and safe doesn't cut it anymore. As I said, we're looking for that innovation, value-adding type of stuff, so you have to have the mindset that you want to develop and bring something new and generate added value to the company." (Vice President, Treasury & Financial Shared Services, Beta)*

The earlier findings on the BPM view of RPA suggested also a change in mindset towards development methods from the operations management and software development environment. This may be another area where the finance and SSC functions could develop further and this may require new skills from future experts in these domains.

5.6.6 Strategic considerations

The beginning could be described as experimental for the studied companies. Existing resources were used to do initial proofs of concept, but at the same time the supporting organizations were being set up. With a new technology like RPA, its role in the rest of the company strategy and digitalization had to be understood.

> *"We have here this discussion on-going that how does this digitalization now really, how do we tackle this digitalization in a way that it isn't just an incremental thing, but a larger transformation, and there we have started then to, kind of, train our people about what digitalization is and what RPA is as a part of it, etc., and quite a lot there are these fears of it and then there's also this healthy curiosity. So there's a bit of both, but I would say, that mostly people are still less afraid than they are curious. So in that sense it's still a positive situation." (Vice President, Finance Processes and Systems, Alpha)*

Alpha was about to harmonize its SAP environments from several to only one newer version potentially bringing new technological capabilities, this progress needed to be understood against the plans to implement RPA:

> *"…when we start to make bots in this current world of ours, we need to understand that is it viable to do on this time span when SAP 4/Hana is coming." (Director, Digital Finance, Alpha)*

It is not self-evident that the capability in question should even be called specifically an RPA capability as RPA is only one tool, as was emphasized by several interviewees. Taking some more distance to this question quickly leads to notions of automation or process capabilities or even digitalization capabilities. However, RPA does require some specific competences in building and operating the software bots as well as process development knowledge and, also, the companies had established specialized functions to

support the RPA development and with this showing in a very concrete way that it was something requiring unique competences.

In the end, the RPA capability was not being developed in a vacuum as its own standalone initiative, but usually as the result of a broader automation or digitalization strategy. As an example, the Alpha finance function had its own digitalization strategy where systems were to be developed specifically with business processes in mind and in the short-term the aim was to get rid of the legacy systems. New cloud-based systems were to allow for entirely new types of business processes to be run. It remains to be seen what the role of RPA will be after a while with the progress in the other elements of the digitalization strategy.

Delta had an automation strategy as a subcategory of its higher level corporate strategy. The company had a centralized process efficiency unit where the RPA Center of Excellence was located, so RPA was just one, even if significant, tool for driving process efficiency and this was reflected even in the company's functional hierarchy.

All in all, the RPA journey consists of several decision points along the way which then impact the decisions that follow making the endeavor essentially path-dependent (Teece et al., 1997). Decisions about e.g. resources, making or buying and learning mechanisms are made resulting in the end in what is hopefully a strong RPA capability supporting the search for competitive advantage.

6 Discussion

In the following, the findings of the previous section will be discussed by contrasting them with the earlier literature review. The section is constructed by first discussing the findings in light of the first research question on the benefits and challenges of RPA adoption after which the focus will be on the second research question of capability development.

6.1 RPA benefits and challenges

The literature on RPA is still very scarce. Following from this, also only limited research has accumulated of its benefits and challenges. The main benefits found in this study are largely congruent with earlier findings (Lacity and Willcocks, 2016a and 2016b; Suri et al., 2017; Hallikainen et al., 2018). Benefits like cost savings, speed and quality are expected benefits with all kinds of development initiatives.

Compared to the few earlier studies, this study adds some depth in its analysis of the benefits. The conducted semi-structured interviews allowed more flexibility in delving deeper into emergent interesting issues and to ask probing questions. What became clear is that the benefits are many, they are somewhat overlapping and they need to be considered as a whole.

Some basic characteristics of RPA bring about most of its benefits: RPA can, at least in theory (this would require careful scheduling), operate 24/7 without breaks; it will perform tasks exactly as programmed; its use can also be scaled up and down with changing demand (Lacity and Willcocks, 2016a). As a result, time can be saved, errors eliminated and quality improved, speed of operations increased and, as a consequence, lead times shortened. All of these can then also increase customer satisfaction both externally as well as internally, depending on the robotized service. The saved time can be capitalized on by either reducing FTEs or by transferring personnel to perform more value-added work. Probably in many cases, it will be used to do a bit of both.

A small surprise was the very contained enthusiasm for the benefit of FTE reductions which could result in cost savings. This has been recognized as a main benefit by earlier studies (Lacity and Willcocks, 2016a; Suri et al., 2017). In this study, cost savings were seen as an obvious benefit, but the cost saving potential from RPA alone did not seem like a very significant incentive. Much is expected also from other means of development initiatives like organizational changes, the transfer from legacy ERP systems into newer

versions as well as from artificial intelligence. There were controls in place and initiatives on-going to either, at a minimum, keep costs stable or reduce them. Support functions like the finance function are under constant pressure to keep costs low (e.g. Suri et al., 2017) while, at the same time, expectations for additional services rise. Possibly as a result of this pressure, more value from RPA was seen in its ability to increase workloads instead of cutting on personnel. At the risk of sounding speculative, it would be interesting to know if more value would have been placed on the cost savings opportunity of robotics if it was introduced to companies right after the financial crisis at the turn of the decade. The underlying assumption here being that companies have already cut down on costs aggressively in recent years and so the remaining potential is not as great as it would have been ten years ago.

The positive effects on employee engagement and satisfaction were also emphasized by several interviewees. If benefits were to be seen as a hierarchy, employee satisfaction could be argued to be a type of second-order benefit flowing from the first-order benefits that RPA brings about. RPA essentially frees up time for more interesting tasks and therein lies value for employees. Depending on how much time is saved, job specifications can be changed slightly or a lot, even creating new roles entailing more innovative work. Another source of satisfaction for the more technology-oriented employees can be the opportunity to learn about this technology and possibly even to take more control of their own work by automating parts of their jobs.

A more implicit benefit of RPA recognized in this study is how it acts as a driver for process redesign. RPA enables automation in new areas and so it may increase process-oriented thinking in the organization. More activities can be organized and redesigned into efficient, automated processes. Realizing the opportunities of RPA can enhance the redesign of current processes as their logic must be enforced to be more rules-based in order to be automated with RPA.

Looking at the challenges of RPA, the literature (Lacity and Willcocks, 2016b; Suri et al., 2017) recognized the fear of a loss of jobs as a challenge. In this study, this topic came up, but the managers interviewed here did not see this as a huge challenge even though communications were seen as important in alleviating possible fears. However, it would be naïve to believe that this fear would not be present at the lower levels of the organizational hierarchy.

The fact that FTE reductions were not seen as a very significant benefit could also be the reason why fear of job loss was not perceived as much of a challenge. The companies had in many cases other, more value-adding, uses for their staff and so a tremendous fear of job loss is not reasonable. Furthermore, as some work had been already outsourced, part of the effect on jobs would be on the jobs of external resources, so then suppliers could take the hit of diminishing work.

Many companies still have their SSCs outsourced to offshore locations like India. Only time will tell how these constructions of labor arbitrage will evolve as companies now have a new tool at their disposal to automate work. This study did provide some evidence that some companies do see RPA as an enabler to not offshore or outsource work, but instead to keep it in-house in the hands of highly skilled experts able to leverage RPA to produce more output. As mentioned, Beta had found success in this strategy.

Suri et al. (2017) found in their survey, that a lack of resources is recognized as a challenge in RPA adoption and this study supports the claim. Large companies are usually in a constant state of change with several development initiatives on-going simultaneously. At the same time, cost overruns need to be contained. This may result in resource scarcity on the part of the RPA development initiative.

Another challenge found in this study was how to communicate the vision to the rest of the organization. This challenge relates to change management. Success in handling the challenge of communications can also yield help with the challenge of scarce resources. Selling a clear business case to all stakeholders from management to process owners and IT is important to advance the initiative.

In order to draw all the benefits of RPA, companies must find a way to scale the RPA opportunities. This was singled out as a challenge of its own in this study. There is some resemblance to the challenge formulated by Suri et al. (2017) as a “lack of understanding of what RPA means and where it can be applied”. As the technology is new, it requires a bit of time to get acquainted with and to understand where the best opportunities lie. In addition, a certain balancing act is required since RPA is not the superior tool for all automation needs. Instead, it works to automate that long tail of IT development needs (Lacity and Willcocks, 2016a) which are never high enough on the agenda to actually be automated.

Hence, the issue is to find opportunities of scale for a tool which is in the end best suited to automate processes with rather low volumes. This is not to say that high-volume processes could not be automated with RPA and they certainly are automated in some cases. However, systems development in the source systems is often the primary way to automate the highest volume processes. Some ways the companies in this study were finding the scalable opportunities was to reuse modules of the robots, so that development was not required to be started from scratch for each new case and, also, by gathering large amounts of ideas for automation which cumulatively amounted to high volumes. The use of temporary robots for more ad hoc needs was interesting as this is something specifically suitable for RPA and these types of needs are not viable to be solved by use of traditional systems development.

Last, succeeding in building end-to-end processes stretching over functional boundaries can pose a challenge. The importance of the cross-functionality of processes has been recognized in the literature early on (Armistead and Machin, 1997), but this is clearly easier said than done. Especially larger companies often attempt to solve this issue by appointing process owners dedicated to taking responsibility for the process end-to-end and these types of positions were recognized also in the companies studied here.

6.2 Capability development

The findings in this study indicate that an RPA capability, which several companies were at the time of the study developing, cannot be considered a dynamic one. Teece's (2014) features of ordinary capabilities fit better with what the companies in this study were aiming at with their RPA capability. According to Teece (2014), ordinary capabilities target technical efficiency through best practices and doing things right. They are also mostly interested with operations and proper governance as well as cost control (ibid). In addition, ordinary capabilities are fairly easy to imitate and can be bought from the market or be built internally (ibid).

A more operations management approach towards RPA was evident at the studied companies and was reflected e.g. in the importance placed on process reengineering, lean methods, continuous improvement and the general search for efficiency. In addition, best practices were sought for with support from consultancies and through dialogue with other companies building their own RPA capability.

The fact that RPA is only one tool among others in the search for more efficient business processes, which was frequently highlighted in the interviews, provides more evidence that RPA should not be considered a dynamic capability in itself. However, it is interesting to note that most companies did not consider it optimal to just outsource the capability completely. Value was clearly seen in keeping parts of the capability, or even all of it, in-house. Especially the functions and businesses further along the road with their RPA journey placed more value on the internal capability. This strong emphasis on internally generated capability is more akin to how dynamic capabilities come to exist according to the literature (Ambrosini and Bowman, 2009; Teece, 2014).

If the RPA capability under study here is the ordinary, zero-level, capability, what is then the higher-order dynamic capability extending, modifying, creating (Winter, 2003) and directing (Teece, 2014) the ordinary RPA capability? This higher-order capability could be called a dynamic BPM capability. This is aligned with Niehaves et al. (2014) suggesting that BPM is a dynamic capability. As mentioned in the literature review, BPM is an overarching "umbrella term" covering all types of process development (Niehaves et al., 2014) and, as such, can be considered to be located conceptually far enough from the everyday operations to constitute a distinct dynamic capability of its own.

Central to a dynamic BPM capability, or any dynamic capability for that matter, are the capacities to sense, seize and transform (Teece, 2014). In this case, sensing their environment has led firms to identify a new technological opportunity, namely, RPA. In the case of RPA, this does not yet require extraordinary sensing capacity as the triggers are practically everywhere to spot this opportunity if one does even a limited amount of technology evaluation. However, the findings in this study show some evidence that the RPA opportunity can be sensed in different ways and possibly lead to very different outcomes. Companies need to understand the role this particular technology plays in a possibly vast scope of existing technologies used at the company as well as the even wider array of possible options available out in the market.

Seizing is the "mobilization of resources to address…opportunities" (Teece, 2014) and is the more difficult part of actually creating the RPA capability. The RPA software vendor needs to be selected; human resources internal and external to the firm and from different functions need to be deployed; communication of the vision is required; and suitable learning mechanisms need to be implemented. The findings from the field in this study

showed how part of the identification of automation opportunities needs to come from the process owners themselves. These people are widely dispersed around the organization. It could almost be stated that any office worker is a potential RPA process owner whether they currently recognize it or not. This means that a broad-based mobilization of human resources is needed to seize the RPA opportunity. It does not mean that everyone is enrolled completely in the RPA effort, but rather that the communications need to span far and wide to find employees interested in investing a little bit of their time to understand what RPA is and learn how to possibly benefit from it.

As Teece (2007) notes, the cognitive orientation of the organizational actors has an impact on outcomes. Especially the managers' cognitive positions matter (Gavetti, 2005) and managerial capabilities are sources of heterogeneity (Adner and Helfat, 2003). It could then be argued, that how sensing, seizing and transforming manifest themselves in an organization is highly contingent on who the particular actors themselves are. With decisions concerning RPA (and probably any technology), choosing the people calling the shots is then crucial as their cognitive orientations set the direction for the endeavor.

The path a firm has travelled (Teece et al., 1997) also dictates the possible paths ahead and this was visible in the study findings e.g. in many companies' earlier decisions to outsource their business processes. This decision taken earlier, before the emergence of RPA, now limited their options at least in the short term to robotize processes as they choose. It may also limit the possibility to capture value from RPA as processes cross firm boundaries making it more difficult to coordinate assets external to the firm (Teece et al., 1997).

In the formulation of Teece et al. (1997) this would be a matter of asset positions where the actual technological asset (RPA) is controlled by the firm, but part of the human resources involved in the process are outsourced. The BPO provider has little incentive to give all of the added value of automation to its customer unless obligated to do so e.g. due to a contract. This type of contract would probably be very difficult to formulate as what constitutes the value is difficult to specify in concrete terms. This issue of value capture was one of the reasons Beta decided to keep its finance SSC in-house.

From an organizational knowledge and knowledge management perspective, it is interesting that without specifically aiming at this, RPA appears also as a tool for codifying knowledge of processes. Here, from the technology perspective of knowledge management

(Prieto and Easterby-Smith, 2006), RPA functions as a depository of knowledge on organizational processes. For knowledge management, the specific value of RPA lies not in the established processes already codified long ago, because they have already been clearly identified as requiring work instructions. Instead, the value of codification exists more in the processes which would not even necessarily have been recognized as processes before the adoption of RPA. Thus, the process has been recognized and codified in the RPA software initially because of this new type of deliberate process orientation which RPA brings about.

As for learning mechanisms, the companies started off through experimentation where learning-by-doing was central. At the same time, more careful planning was taking place and as the capability developed, also more deliberate learning mechanisms were put in place. Deliberate learning mechanisms can be categorized for example into: functional and staffing, tool based, training and third-party solutions (Heimeriks et al., 2009). All of these solutions were recognized as being used by the companies to varying degrees in capability development. Specialized functions in the form of Centers of Excellence were being set up (i.e. a functional solution). A degree of formality was often introduced through pre-evaluation forms for deciding which opportunities to prioritize (tool based solutions). A multitude of training was being organized from more high-level eLearnings in the company intranet to more focused hands-on training for superusers (training solutions). Also outside consultants were used for benchmarking type efforts in the beginning to actual development of the software bots at operations (third-party solutions).

Based on the findings in this study, the view of Maritan and Peteraf (2011) of capability development as a virtuous cycle of making and buying is a logical conceptualization. Some resources (both physical as well as human) are sourced from outside of the firm while others already exist within the firm and need to be redeployed to support the RPA initiative. Learning mechanisms interact with resources to build the capability. The dynamic BPM capability acts on top of these resources and ordinary capabilities as an orchestrator of sorts to direct them towards the highest payoff.

7 Conclusions

This study set out to examine the benefits and challenges associated with RPA adoption in organizations. A second objective was to explain what resources and capabilities are required to take advantage of RPA and how these capabilities develop in organizations. Also, RPA as a tool and capability was positioned in the broader context of a dynamic business process management capability.

The theoretical base of this study combines literature close to business process automation, especially business process management, and (dynamic) capabilities research. These create a unique mix of management literature of the operations and strategic kind.

A cross-sectional field study was conducted by way of interviews in five large corporations based in Finland. The approach was justified as it enables a desired compromise between depth and breadth allowing for observations from several companies while simultaneously asking open-ended questions for added depth. Cross-sectional field studies are suitable in situations where a clear theoretical base exists, but its constructs or empirical interpretations are unclear (Lillis and Mundy, 2005). As earlier explained, this is the case with the dynamic capabilities framework (see e.g. Eisenhardt and Martin, 2000; Winter, 2003; Ambrosini and Bowman, 2009; Helfat and Winter, 2011).

To conclude the study, its main theoretical contributions will be presented next and followed by the more practical contributions in the subsection of managerial implications. Lastly, as the research process has a tendency to raise new questions which all cannot be answered within a single study, some future research opportunities are suggested.

7.1 Main academic contributions

The study in question can be seen as contributing to research in three distinct ways. First, it provides much needed academic inquiry into an emerging new technology, namely, RPA. As mentioned, research on RPA has thus far received greater interest from the consulting industry and business-oriented journals. While academic inquiry understandably lags behind the speed of the marketing organizations of consultancies, interesting research questions can be formulated on RPA also for academic purposes. Second, it contributes to the highly theoretical and abstract dynamic capabilities framework by discussing the theory in light of empirical field study data. Through empirical data, practical examples of

the constructs at work can be illustrated. Third, this study combines theory on business process management with dynamic capabilities in a unique way not encountered often (apart from some notable exceptions: Trkman, 2010 and Niehaves et al., 2014). Traditionally, BPM research has been concerned with maturity models. However, a combination of BPM and dynamic capabilities may better enable prescriptions for practice. (Röglinger et al., 2012; Niehaves et al., 2014)

The first research question was formulated to understand the benefits and challenges of adopting RPA in organizations. This study found many of the same benefits and challenges as the limited earlier research discussing these questions (Lacity and Willcocks, 2016a and 2016b; Suri et al., 2017 and Hallikainen et al., 2018). In addition, some evidence of a more implicit benefit of RPA working as a driver of business process redesign was recognized. As for the challenges, some additional ones were noted like the issue of managing the multitude of dependencies when scaling up RPA use. However, earlier studies have used different methods and also have not solely been interested in the benefits and challenges. Hence, much in the way of conclusions cannot be drawn on the differences in findings between studies.

Added depth to the question on benefits and challenges was introduced in this study. A main benefit of RPA is the time it saves. An interesting finding was the relatively low enthusiasm to capitalize on this benefit in the form of cost savings. The companies studied here were more interested in the possibility to add more value by shifting people to more productive and innovative work. Also, simply being able to perform more work through more efficient automated processes was favored. On the other hand, this is also another side of cost savings, i.e. controlling cost overruns while increasing the workload. The end result is the same, productivity increases, i.e. the cost per unit of output decreases.

Another interesting finding on the benefits side is the possible increase in employee engagement and satisfaction. Despite the seemingly obvious negative effects associated with automation in the form of job losses, RPA was seen as having potential in also improving the satisfaction and engagement of employees in different ways.

As for challenges of RPA adoption, a notable finding was the challenge of finding scalable opportunities. RPA is very general purpose in that it can work across very different IT

systems and, thus, it can be difficult to know where to focus to draw a maximal amount of benefit.

The second research question interested in what a RPA capability is and how it develops, aimed at viewing the issue through the lens of the dynamic capabilities framework. Here, the conclusion was that the RPA capability is an ordinary, first-order, capability directed by a higher-order dynamic BPM capability. Rationale was also provided for this conclusion. Also Niehaves et al. (2014) have suggested that BPM could be a distinct dynamic capability of its own.

Teece (2014) emphasizes sensing, seizing and transforming as elementary capacities for dynamic capabilities. It was argued that sensing the RPA opportunity and understanding it correctly is important for developing the capability in the right direction. Furthermore, seizing the RPA opportunity effectively requires broad-based cooperation across business and functional hierarchies. Here, communication was seen as being of paramount importance in diffusing the capability within the organization.

Especially the companies with more mature RPA operations considered it important to keep some parts of the capability in-house, like a centralized Center of Excellence responsible for the maintenance of the software bots. Dedicated functions are also suggested by earlier findings for speeding up learning processes to build capabilities (Kale and Singh, 2007; Heimeriks et al., 2009). Also internal and functional personnel were trained to be experts or at least ambassadors for RPA within the organization.

To summarize, the RPA capability development as recognized in this study is closest to that of the suggestion of Maritan and Peteraf (2011), where buying and making together form a virtuous cycle of capability development. Some resources – like initial benchmarking, the RPA software and simple scripting – are bought from the market while learning processes are initiated within the organization to create knowledge. As a result, an RPA capability is accumulated as a combination of the externally sourced resources and the internal resources and learning processes coordinated from a centralized function. The dynamic BPM capability orchestrates these lower-level activities.

7.2 Managerial implications

This study shows that the dynamic capabilities framework can aid managers in conceptualizing the different capabilities of an organization. Thinking of the organization in terms of valuable resources and capabilities of different orders can assist the manager in orchestrating assets (Teece, 2007) to achieve desired outcomes.

With this study as an example, a manager needs to understand to not put technology first no matter how much promise it seems to hold. Instead, by thinking in terms of a dynamic BPM capability, the organization can understand that its main goal is to achieve (hopefully sustainable) competitive advantage, in this case (as a firm can have several dynamic capabilities), through effective and efficient business processes. To achieve this, the organization needs to build an optimal combination of ordinary capabilities – of which the RPA capability is only one – through which it operates and governs processes.

Based on this study, other possibly useful ordinary capabilities for business process management could be those in lean and agile development methods as well as those relating to BPMS and workflow management systems. The dynamic BPM capability will then serve to extend, modify (Winter, 2003) and direct (Teece, 2014) these ordinary capabilities as well create (Winter, 2003) new ones when needed.

Before implementing RPA in any drastic measure, managers would do well to also understand their current systems and process landscape and to have a technology development roadmap available scoping out the development trajectories of other systems as they may have implications on business processes. RPA looks to be a tool which is easy to implement, but mastering it and scaling up its use may require more diligent planning.

An important decision to be made is the level of involvement of the personnel near the processes in actually programming the software bots for operation. Different approaches were found in this study with one company having a lot of its business and functional experts also doing programming work on the bots while others resorted to specialized teams of robotics programmers. Based on findings in this study, conclusions cannot be drawn as to whether any one approach is superior, but the fact that companies are letting their personnel essentially program software – even if different from the usual software development – implies that a possibly fundamental change is on-going in the opportunities for office workers to automate their own work also independently.

This study also provided some evidence that the required skills of finance personnel may be changing somewhat towards business process automation skills and a development mindset. A transition to more innovative project work may be in progress, but the findings in this study are not adequate to state much on these issues.

7.3 Opportunities for further research

As was already brought up in the introduction, the accounting literature has not so far been concerned with RPA. It was also shown here that RPA is a very relevant technology especially within accounting processes. Hence, several possibilities exist for involving RPA in accounting research. Further interesting research questions could be found for example by relating RPA to accounting research contexts like management control systems, auditing or the role of the management accountant.

As for research on capabilities, this study only scratched the surface of what a dynamic BPM capability might entail and how capabilities are deliberately developed. More longitudinal single-case studies focused specifically on the higher-order dynamic capability of BPM could prove valuable in moving field research on dynamic capabilities forward.

References

Adner, R., & Helfat, C. E. (2003). Corporate effects and dynamic managerial capabilities. *Strategic Management Journal*, 24, 1011-1025.

Ahrens, T. & Chapman, C. S. (2006). Doing qualitative field research in management accounting: positioning data to contribute to theory. *Accounting, Organizations and Society*, 31, 819-841.

Ambrosini, V. & Bowman, C. (2009). What are dynamic capabilities and are they a useful construct in strategic management. *International Journal of Management Reviews*, 11 (1), 29-49.

Amit, R. & Schoemaker, P. J. H. (1993). Strategic assets and organizational rent. *Strategic management Journal*, 14 (1), 33-46.

Andreu, R. & Ciborra, C. (1996). Organisational learning and core capabilities development: the role of IT. *Journal of Strategic Information Systems*, 5, 111-127.

Armistead, C. & Machin, S. (1997). Implications of business process management for operations management. *International Journal of Operations & Production Management*, 17 (9), 886-898.

Barney, J. (1991). Firm resources and sustained competitive advantage. *Journal of Management*, 17 (1), 99-120.

Barreto, I. (2010). Dynamic capabilities: a review of past research and an agenda for the future. *Journal of Management*, 36 (1), 256-280.

Boyatzis, R. E. (1998). *Transforming qualitative information: thematic analysis and code development*. Sage Publications, Thousand Oaks (California).

Citi (2016). *Digital disruption: how FinTech is forcing banking to a tipping point*. Citigroup Global Markets Inc., 12-13.

Coen, C. A. & Maritan C. A. (2011). Investing in capabilities: the dynamics of resource allocation. *Organization Science*, 22 (1), 99-117.

Collis, D. J. (1994). How valuable are organizational capabilities? *Strategic Management Journal*, 15, 143-152.

Danneels, E. (2010). Trying to become a different kind of company: dynamic capability at Smith Corona. *Strategic Management Journal*, 32, 1-31.

Davenport, T. H. & Kirby, J. (2016). Just how smart are smart machines? *MIT Sloan Management Review*, 57 (3), 20-25.

Davenport, T. H. & Short, J. E. (1990). The new industrial engineering: information technology and business process redesign. *Sloan Management Review*, 31 (4), 11-27.

Di Stefano, G., Peteraf, M. & Verona, G. (2014). The organizational drivetrain: a road to integration of dynamic capabilities research. *The Academy of Management Perspectives*, 28 (4), 307-327.

Dubois, A. & Gadde L-E. (2002). Systematic combining: an abductive approach to case research. *Journal of Business Research*, 55, 553-560.

Easterby-Smith, M. & Prieto, I. M. (2008). Dynamic capabilities and knowledge management: an integrative role for learning? *British Journal of Management*, 19, 235-249.

Eisenhardt, K. M., Furr, N. R. & Bingham C. B. (2010). Microfoundations of performance: balancing efficiency and flexibility in dynamic environments. *Organization Science*, 21 (6), 1263-1273.

Eisenhardt, K. M. & Graebner, M. E. (2007). Theory building from cases: opportunities and challenges. *Academy of Management Journal*, 50 (1), 25-32.

Eisenhardt, K. M. & Martin, J. A. (2000). Dynamic capabilities: what are they? *Strategic Management Journal*, 21, 1105-1121.

Ethiraj, S. K., Kale, P., Krishnan, M. S. & Singh, J. V. (2005). Where do capabilities come from and how do they matter? A study in the software services industry. *Strategic Management Journal*, 26, 25-45.

Frey, C. B. & Osborne, M. A. (2017). The future of employment: how susceptible are jobs to computerisation? *Technological Forecasting & Social Change*, 114, 254-280.

Gavetti, G. (2005). Cognition and hierarchy: rethinking the microfoundations of capabilities' development. *Organization Science*, 16 (6), 599-617.

Grover, V. & Malhotra, M. K. (1997). Business process reengineering: a tutorial on the concept, evolution, method, technology and application. *Journal of Operations Management*, 15, 193-213.

Hammer, M. (1990). Reengineering work: don't automate, obliterate. *Harvard Business Review*, 68 (4), 104-112.

Hammer, M. (2001). *The agenda: what every business must do to dominate the decade*. Crown Business, New York.

Hallikainen, P., Bekkhus, R. & Pan, S. L. (2018). How OpusCapita used internal RPA capabilities to offer services to clients. *MIS Quarterly Executive*, 17 (1), 41-52.

Heimeriks, K. H., Klijn, E. & Reuer, J. J. (2009). Building capabilities for alliance portfolios. *Long Range Planning*, 42, 96-114.

Helfat, C. E. & Peteraf, M. A. (2015). Managerial cognitive capabilities and the microfoundations of dynamic capabilities. *Strategic Management Journal*, 36, 831-850.

Helfat, C. E. & Winter, S. G. (2011). Untangling dynamic and operational capabilities: strategy for the (n)ever-changing world. *Strategic Management Journal*, 32, 1243-1250.

Hung, R. Y-Y. (2006). Business process management as competitive advantage: a review and empirical study. *Total Quality Management*, 17 (1), 21-40.

IRPA AI (2018). *Definition and Benefits*. Available from: https://irpaai.com/definition-and-benefits/ [Accessed on 2 May 2018].

Kale, P. & Singh, H. (2007). Building firm capabilities through learning: the role of the alliance learning process in alliance capability and firm-level alliance success. *Strategic Management Journal*, 28 (10), 981-1000.

Kettinger, W. J., Teng, J. T. C. & Guha, S. (1997). Business process change: a study of methodologies, techniques, and tools. *MIS Quarterly*, 21 (1), 55-80.

Keynes, J. M. (1930). Economic possibilities for our grandchildren I. *The Nation and Athenaeum*, 11 October, 36-37.

Ko, R. K. L., Lee, S. S. G. & Lee, E. W. (2009). Business process management (BPM) standards: a survey. *Business Process Management Journal*, 15 (5), 744-79

Kokina, J. & Davenport T. H. (2017). The emergence of artificial intelligence: how automation is changing auditing. *Journal of Emerging Technologies in Accounting*, 14 (1), 115-122.

Kraatz, M. S. & Zajac, E. J. (2001). How organizational resources affect strategic change and performance in turbulent environments: theory and evidence. *Organization Science*, 12 (5), 632-657.

Laamanen, T. & Wallin, J. (2009). Cognitive dynamics of capability development paths. *Journal of Management Studies*, 46 (6), 950-981.

Lacity, M. C. & Willcocks, L. P. (2016a). Robotic process automation at Telefónica O2. *MIS Quarterly Executive*, 15 (1), 21-35.

Lacity, M. C. & Willcocks, L. P. (2016b). A new approach to automating services. *MIT Sloan Management Review*, 58 (1), 40-49.

Lee, R. G. & Dale, B. G. (1998). Business process management: a review and evaluation. *Business Process Management Journal*, 4 (3), 214-225.

Leiblein, M. J. (2011). What do resource- and capability-based theories propose? *Journal of Management*, 37 (4), 909-932.

Lillis, A. M. & Mundy, J. (2005). Cross-sectional field studies in management accounting research – closing the gaps between surveys and case studies. *Journal of Management Accounting Research*, 17, 119-141.

Lindsay, A., Downs, D. & Lunn, K. (2003). Business processes – attempts to find a definition. *Information and Software Technology*, 45, 1015-1019.

Makadok, R. (2001). Toward a synthesis of the resource-based and dynamic-capability views of rent creation. *Strategic Management Journal*, 22 (5), 387-401.

Maritan, C. A. (2001). Capital investment as investing in organizational capabilities: an empirically grounded process model. *Academy of Management Journal*, 44 (3), 513-531.

Maritan, C. A. & Alessandri, T. M. (2007). Capabilities, real options, and the resource allocation process. *Real Options Theory (Advances in Strategic Management)*, 24, 307-332.

Maritan, C. A. & Lee, G. K. (2017). Bringing a resource and capability lens to resource allocation. *Journal of Management*, 43 (8), 2609-2619.

Maritan C. A. & Peteraf, M. A. (2011). Building a bridge between resource acquisition and resource accumulation. *Journal of Management*, 37 (5), 1374-1389.

McKinnon, J. (1988). Reliability and validity in field research: some strategies and tactics. *Accounting, Auditing and Accountability Journal*, 1 (1), 34-54.

Narayanan, V. K., Colwell, K. & Douglas, F. L. (2009). Building organizational and scientific platforms in the pharmaceutical industry: a process perspective on the development of dynamic capabilities. *British Journal of Management*, 20, 25-40.

Nelson, R. R. & Winter, S. G. (1982). *An evolutionary theory of economic change*. The Belknap Press of Harvard University Press, Cambridge (Massachusets).

Niehaves, B., Pöppelbuß, J., Plattfaut, R. & Becker, J. (2014). BPM capability development – a matter of contingencies. *Business Process Management Journal*, 20 (1), 90-106.

O'Neill, P. & Sohal, A. S. (1999). Business process reengineering a review of recent literature. *Technovation*, 19, 571-581.

Pavlou, P. A. & El Sawy, O. A. (2011). Understanding the elusive black box of dynamic capabilities. *Decision Sciences*, 42 (1), 239-273.

Penrose, E. T. (1959). *The theory of the growth of the firm*. John Wiley, New York.

Prieto, I. M. & Easterby-Smith, M. (2006). Dynamic capabilities and the role of organizational knowledge: an exploration. *European Journal of Information Systems*, 15, 500-510.

Pritchard, J-P. & Armistead, C. (1999). Business process management – lessons from European business. *Business Process Management Journal*, 5 (1), 10-32.

Ridder, H.-G., Hoon, C. & McCandless, A. (2009). The theoretical contribution of case study research to the field of strategy and management. *Research Methodology in Strategy and Management*, 5, 137-175.

Röglinger, M., Pöppelbuß, J. & Becker, J. (2012). Maturity models in business process management. *Business Process Management Journal*, 18 (2), 328-346.

Scapens, R. W. (1990). Researching management accounting practice: the role of case study methods. *British Accounting Review*, 22, 259-281.

Simon, H. A. (1955). A behavioral model of rational choice. *The Quarterly Journal of Economics*, 69 (1), 99-118.

Sirmon, D. G., Hitt, M. A. & Ireland, R. D. (2007). Managing firm resources in dynamic environments to create value: looking inside the black box. *Academy of Management Review*, 32 (1), 273-292.

Smart, P. A., Maddern, H. & Maull, R. S. (2009). Understanding business process management: implications for theory and practice. *British Journal of Management*, 20, 491-507.

Suri, V. K., Elia, M. & van Hillegersberg, J. (2017). Software bots – the next frontier for shared services and functional excellence. In: Oshri I., Kotlarsky J., Willcocks L. (ed.) *Global Sourcing of Digital Services: Micro and Macro Perspectives. Lecture Notes in Business Information Processing*, 306, 81-94. Springer International Publishing.

Teece, D. J. (2007). Explicating dynamic capabilities: the nature and microfoundations of (sustainable) enterprise performance. *Strategic Management Journal*, 28, 1319-1350.

Teece, D. J. (2012). Dynamic capabilities: routines versus entrepreneurial action. *Journal of Management Studies*, 49 (8), 1395-1401.

Teece, D. J. (2014). The foundations of enterprise performance: dynamic and ordinary capabilities in an (economic) theory of firms. *The Academy of Management Perspectives*, 28 (4), 328-352.

Teece, D. J., Pisano, G. & Shuen, A. (1997). Dynamic capabilities and strategic management. *Strategic Management Journal*, 18 (7), 509-533.

Teng, J. T. C., Grover, V. & Fiedler, K. D. (1994). Business process reengineering: charting a strategic path for the information age. *California Management Review*, 36 (3), 9-31.

Trkman, P. (2010). The critical success factors of business process management. *International Journal of Information Management*, 30, 125-134.

Vaivio, J. (2008). Qualitative management accounting research: rationale, pitfalls and potential. *Qualitative Research in Accounting & Management*, 5 (1), 64-86.

Vom Brocke, J., Schmiedel, T., Recker, J., Trkman, P., Mertens, W. & Viaene, S. (2014). Ten principles of good business process management. *Business Process Management Journal*, 20 (4), 530-548.

Wernerfelt, B. (1984). A resource-based view of the firm. *Strategic Management Journal*, 5 (2), 171-180.

Weske, M., van der Aalst, W. M. P. & Verbeek, H. M. W. (2004). Advances in business process management. *Data & Knowledge Engineering*, 50, 1-8.

Williamson, O. E. (1999). Strategy research: governance and competence perspectives. *Strategic Management Journal*, 20 (12), 1087-1108.

Winter, S. G. (2003). Understanding dynamic capabilities. *Strategic Management Journal*, 24, 991-995.

Zahra, S. A., Sapienza, H. J. & Davidsson, P. (2006). Entrepreneurship and dynamic capabilities: a review, model and research agenda, *Journal of Management Studies*, 43 (4), 917-955.

Zairi, M. (1997). Business process management: a boundaryless approach to modern competitiveness. *Business Process Management Journal*, 3 (1), 64-80.

Zollo, M. & Winter, S. G. (2002). Deliberate learning and the evolution of dynamic capabilities. *Organization Science*, 13 (3), 339-351.

Appendices

Appendix A: Interviews

Interviewee(s)	Company	Date	Duration
Vice President, Finance Processes and Systems	Alpha	15.2.2018	101 min
Director, Digital Finance; Finance Digitalization Specialist	Alpha	28.2.2018	48 min
Head of Service Unit Processes and Robotics	Alpha	2.3.2018	57 min
Vice President, Treasury & Financial Shared Services; Manager, Cash Management; Manager, SSC	Beta	19.3.2018	88 min
Head of Robotics	Delta	26.2.2018	63 min
Director, Global Process Owner for Finance	Omega	5.3.2018	52 min
Head of Finance Development & SSC	Omega	19.2.2018	69 min
Finance Development Director	Zeta	22.1.2018	43 min
Finance Development Manager	Zeta	1.2.2018	40 min
Vice President, Group Finance & Control	Zeta	14.2.2018	34 min

Appendix B: Question template for interviews

Background information of interviewee

Name

Title and role in the organization

Role with RPA

How do you define RPA?

Role of RPA and operating model

When and why has RPA been implemented in the company?

Where is RPA being used in the company where is it most useful?

How and who decides where RPA is to be used? What criteria are used for choosing the application areas?

Are there areas where RPA is not used at all or it is not seen as having potential?

What RPA systems are in use in the company? Who are the software vendors?

What kind of organization exists to support RPA and how has it developed?

Where in the organization is the ownership of RPA?

What is the RPA operating model like?

Does RPA have a role in the company strategy?

Does use of RPA require changes in procedures and processes? If yes, what kind of changes?

What benefits and challenges arise from RPA?

Knowledge and learning

How does knowledge and understanding of RPA develop in the company?

Is direct training in RPA organized? For whom?

Does learning happen in other ways?

Implications on personnel

How has the technology been received?

What does RPA use require from personnel?