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Scaling Up Robotic Process Automation Capabilities Organisation-Wide

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SYMBOLS & ABBREVIATIONS

BPA	Business Process Automation
BPM	Business Process Management
COE	Center of Excellence
FTE	Full-Time Equivalent
IA	Intelligent Automation
KPI	Key Performance Indicator
POC	Proof of Concept
RPA	Robotic Process Automation

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ABSTRACT:

This research uses explanatory case study as the research strategy to examine how robotic process automation (RPA) operating models have evolved over time in RPA environment, how companies have approached internal capability building for robotic process automation, and what kind of roles are typically established in a cross-functional setting in a mature organisation. Research material was collected using semi-structured interviews and literature review.

RPA is a type of service automation that aims to automate "swivel chair" processes – tasks where human takes data from a source and inputs the same or similar data into one or multiple systems. In RPA software agents are harnessed to do these rule-based manual tasks.

On the basis of the data collected operating models was built for a cross-functional RPA implementation setting, as well as typical roles needed. Shifting focus on internal capability building in different stages of RPA maturity was observed and the preferred roles to concentrate when building this capability. Based on the literature review RPA center of excellence three capability stages are also introduced. Managerial implications on RPA internal capability building, organisational models, and internal information sharing are presented. Many of the observations follow findings of the existing literature. Nevertheless, these findings are positioned and expanded in the scope of mature RPA organisations.

KEYWORDS: RPA, software automation, organisation model, center of excellence

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TIIVISTELMÄ:

Tässä tutkimuksessa käytetään selittävää tapaustutkimusta tutkimusstrategiana. Tutkimuksessa pyritään selvittämään kuinka ohjelmistorobotiikan toimintamallit ovat kehittyneet ajan myötä ohjelmistorobotiikassa, miten yritykset ovat lähestyneet ohjelmistorobotiikassa sisäisten valmiuksien kehittämistä ja millaiset roolit muodostuvat ristiin - toimintaympäristö kehittyneessä ohjelmistorobotiikka organisaatiossa. Tutkimusaineisto kerättiin käyttämällä osarakenteisia haastatteluja ja kirjallisuuskatsausta.

Ohjelmistorobotiikka on eräänlainen palveluautomaatio, jonka tarkoituksena on automatisoida kääntötuoliprosessit - tehtävät, joissa ihminen ottaa tietoja lähteestä ja syöttää samat tai samanlaiset tiedot yhteen tai useampaan järjestelmään. Ohjelmistorobotiikka ohjelmistoagentteja käytetään näiden sääntöihin perustuvien manuaalisten tehtävien suorittamiseen.

Kerättyjen tietojen perusteella rakennettiin roolit ja toimintamallit organisaatiorajat ylittävälle ohjelmistorobotiikka ympäristössä. Sisäisten valmiuksien kehittämisen merkitys havaittiin ohjelmistorobotiikan eri vaiheissa, sekä missä rooleissa näillä sisäisillä resursseilla olisi eniten hyötyä. Kirjallisuuskatsauksen perusteella esitellään myös kolme kyvykkyysvaihetta ohjelmistorobotiikan huippuosaamisen keskukselle. Tämän lisäksi esitellään johtajien vaikutuksia ohjelmistorobotiikan sisäiseen valmiuksien rakentamiseen, organisaatiomalleihin ja sisäiseen tiedon jakamiseen. Monet havainnot seuraavat olemassa olevan kirjallisuuden havaintoja. Tässä kyseisessä tutkimuksessa nämä havainnot on sijoitettu ja laajennettu kehittyneiden ohjelmistorobotiikka organisaatioiden piiriin.

AVAINSANAT: RPA**,** ohjelmistorobotiikka, organisaatiomalli, huippukeskus

1 INTRODUCTION

> "*It is unworthy of excellent men to lose hours like slaves in the labour of calculation which could safely be relegated to anyone else if machines were used*."
> - **Gottfried Wilhelm Leibniz, mathematician, philosopher, and inventor (1685)**

While automation of mechanical has been changing the world for centuries – it is the software agents, or robots that are now actively changing the way we work or as consumers interact with services. Robotic Process Automation (RPA) uses software robots meant to copy manual tasks done by human. These software bots offer great possibilities to free people from mundane repetitive tasks and allow people to focus on meaningful higher-value activities. At the same time there are clear societal issues software automation also poses, and familiar dilemmas and fears observed previously with factory automation, as well as some new challenges.

RPA might sound futuristic, and the name coined certainly carries a promise of something futuristic. In short RPA is a type of service automation that aims to automate "swivel chair" processes – tasks where human takes data from a source and inputs the same or similar data into one or multiple systems. In RPA software agents are harnessed to do these rule-based manual tasks. In the end RPA is very much a natural evolution on software automation that has come before it – helped by it hitting a critical mass where competition and software network for it starts to be quite robust. Gill Patt (2015) sees set of technical drivers that have pushed software automation where it is now and will continue to push it forward even without major technical leaps in the field. He sees these drivers to be following: the exponential growth in computing performance, improvements in electrical energy storage, electronics power efficiency, exponential expansion of the availability and performance of local wireless digital communication, the internet, worldwide increase in data storage, and global computation power growth.

1.1 Motivation and Background for the Study

Organisations are seeking constantly ways to be more efficient and leaner to create higher value for shareholders and stakeholders. We see more and more different software solutions being driven outside IT departments as organisations are seeking to increase digitalisation (Leslie Willcocks 2016: 46). This also brings interesting new dynamics within these organisations as these solutions are being managed by business units alongside IT department and what implications this could have in the future.

One of these lightweight software solutions is RPA that has been gaining steam in wide variety of organisations past years thanks to the packaged software being increasingly attainable and readily available from various service providers. This previously specialised software tool has turned into more turnkey cloud-based solutions that are able to help automating more diverse set of tasks. RPA as packaged software tool is still fairly new and there is still lack of research on organisations that are on mature stages with RPA. This has led to gap in knowledge on what kind of operating models and structures have been developed in mature RPA environment after the initial proof of concept was launched.

One of the major benefits of RPA is how it can be leveraged inside the business unit without being dependent on the IT department. This has created wide variety of operating models and governance methods in a field where IT department has accustomed to have a greater role (Asatiani, Kämäräinen & Penttinen 2019: 5-6). This opens wider research topics on what kind roles are being established for lightweight IT software tools being used in a cross-functional setting. Also, how are these business functions building and managing internal capabilities and roles that have not traditionally been inside these functions? To understand this better this research will use explanatory case study conducted in companies headquartered in Finland that are

all in various scales of using RPA, but all in the mature stages of using the technology and the possible varying results of success, or lack of, they have found implementing RPA organisation wide.

1.2 Research Objectives

As derived from the motivation and background section, the objective of the study is to conduct explanatory case study to examine organisations development and their current state in mature RPA setting. Explanatory case study seeks answers for questions such as “how”, “what”, and “why”.

1. *What kind of steps have been taken to build internal RPA capabilities and how are these capabilities structured to ensure functional project pipeline?*

First question of this study examines the different approaches organisations have taken to build their internal capabilities for RPA, and how are these capabilities structured to ensure functional project pipeline. This question reflects the cross-organisational use of RPA in the organisations taking part on the study. Positioning of these internal resources across the organisation in studied companies will be also discussed.

2. *How does the RPA center of excellence need to evolve when RPA is implemented as a* cross-organisational tool?

Second question of this study asks how RPA center of excellence has evolved and what kind of center of excellence operating models can we find in organisations that have scaled their RPA operations into cross-organisational RPA structure. RPA center of excellence capability framework and stages will be introduced in the literature review of the conceptual framework of this study.

3. *What roles are being established in a cross-functional setting in a mature RPA organisation?*

Third question of this study involves analysing different roles that have been created in studied organisations cross-organisational RPA structure.

1.3 Structure of the Study

This study is structured by presenting the relevant literature and theoretical foundation in section two and three, that are relevant to all research questions. Section two will introduce the RPA center of excellence capability framework and stages relevant to question two.

Section four will go through the methodology of the study. Section five will introduce the organisations taking part in the study and cover the findings of the case studies conducted by descripting and incorporating relevant quotes from the interviews of the people involved in this study. These descriptions and quotes are split into different subsections to better assemble the various subject areas.

Section six is the last part of the study and will include discussion and conclusion. In this section findings of the study will be discussed, and conclusion will summarize the findings. After conclusions set of implications for managers will be presented as well.

2 BUSINESS PROCESS MANAGEMENT

In this section we examine business process management and how it links to robotic process automation. Business process management is a wider holistic approach, while robotic process automation is a complimentary tool next to business process management. Both seek the same end goal of improving how the business operates. Strong business process management history also gives a strong foundation for an organisation to build successful robotic process automation project. Robotic process automation requires understood and detailed process documentation. If this already exists in the organisation on the basis of business process management, it gives the organisation good ground to evaluate workflows where robotic process automation would do well. From technological standpoint business process management and robotic process automation are complimentary to each other and will continue to be.

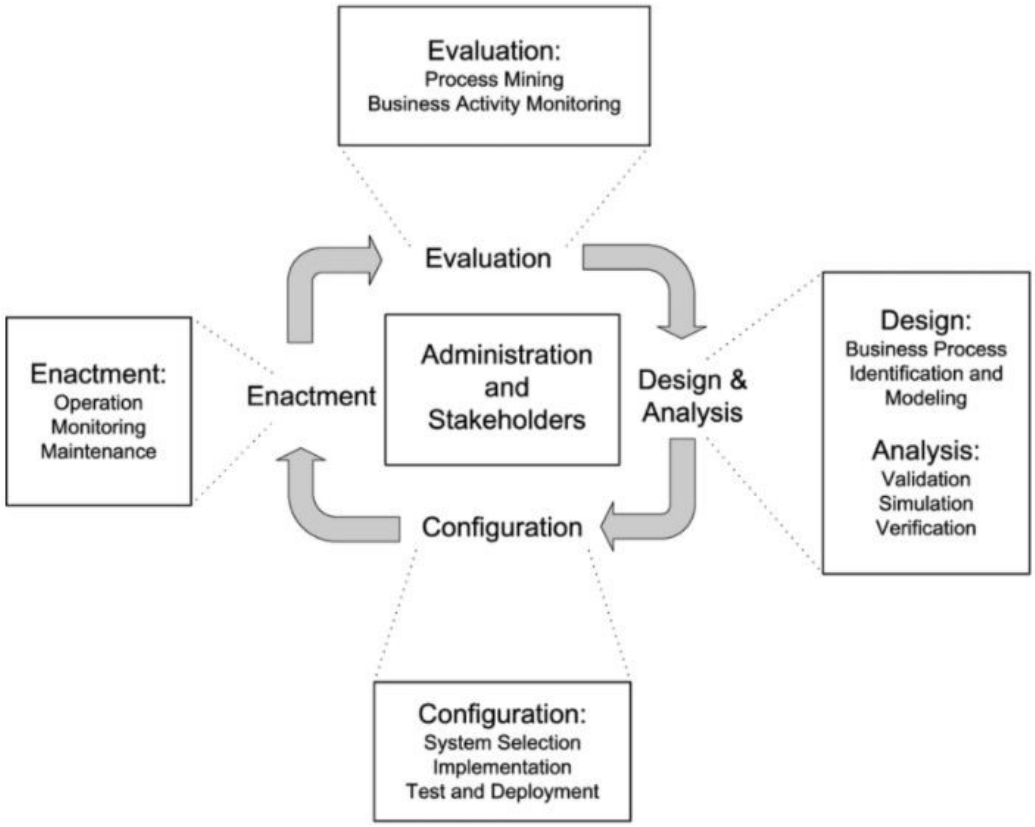
2.1 Business Process Management

Business Process Management (BPM) refers to operations management discipline that focuses on control and managing transactions between organisations and inside the organisation. These transaction flows are viewed as processes. Process can be defined as set of activities designed to convert inputs into outputs. Process effectively gets from from a starting point to where you want to be. It is not just people that can be involved in the process, but computers and machines that then collaboratively create wanted output to external or internal customer (Hammer & Champy 1990: 35).

As such BPM examines the organisation in a wider scope that does not only focus on traditional management activities. BPM includes host of implementation strategies and tools to analyse, evaluate, optimize, model, discover and automate these processes

(Gunyung 2009: 11). BPM has for long been prioritised in the context of digital innovation as it offers a fertile ground to build on top with the standardisation, continues improvement, and automation. It has been challenged by technologies such as RPA, big data, cloud solutions, and other emerging technologies. These new technologies are seeking to introduce more flexibility and agility. This also puts new pressure on business process transformations to happen quicker in the competitive environment (Looy 2020: 1).

Figure 1. BPM lifecycle (Hofstede & Weske 2007: 8).



To better understand BPM Weske (2007: 9) presents BPM in a structured lifecycle model that depicts four phases that are arranged in cyclical structure.

1. The first phase of the BPM lifecycle is design and analysis that has two possible situations with the process being new and has not yet gone through the pipeline or is already performed without support from the established BPM structure. Either way the goal is to create explicit model for the process.
2. In configuration phase the depicted model needs to be implemented. This implantation can be done using policies and procedures that the employees need to follow or using a software alongside procedures to facilitate the enactment of the process.
3. Enactment phase is usually a long-standing structure that works as a control centre to the rules set at design and configuration phases, making sure operation is working under those set constraints and collect data for the next phase.
4. In the evaluation phase the stored log data and performance indications are evaluated using process mining techniques. From this analysis example any possible bottlenecks and connections. This is process analysis is constantly on-going and the results can create demand to do changes or even create a create a new process model.

2.2 Automation

Origins of the term Process Automation can be tracked over 100 years ago to Frederick Tailor's and Henry Ford's management theory that focused on process coordination and intelligent resource allocation under strict workflow guidelines. Encouraging organisations to put more thought on optimizing operations and relating systems. This led to the initial steps taken by Business Process Reengineering and later Business Process Management. All this has laid the groundwork for different automatization methods to be applied in scientific research field and in the working environment. In 1982 FileNet developed a digital workflow system that was used to route scanned

documents according to predefined rule set. FileNet was later acquired by IBM and is seen as the precursor for the upcoming BPM software by IBM and others. First laboratories intended solely for the research of artificial intelligent were established already in 1964 at MIT, Standford and Edinburgh universities. Carnegie Mellon University established its Robotic Institute year later to Pittsburgh. (Baranauskas 2018: 252.)

2.3 Business Process Automation

BPM has direct links to the evolution of different automation strategies and solutions thanks to the early efforts for organisations to start modelling their processes, as well as the pursuit to determine the degree of repetition and structuring. This has created very fertile soil to build automation solutions.

Classical Business Process Automation (BPA) strives to coordinate and distribute tasks to resources. Resources such as humans or software systems. This coordination happens by set logic or temporal dependencies (Dumas, M., Rosa, M.L., Mendling, J. & Reijers, H.A 2013: 19). BPA is usually costly and aims to automate wider process across functions. Because of high budget pressures and long and implementation times companies are often opting to implement the changes by department, if possible (Shpylova 2019: 110).

When looking BPA in a wider scope it is a sprawling field of different terminologies, methods and set of technologies that often overlap each other. Just to name few terminologies and technologies encompassed in BPA: cognitive intelligence, machine intelligence, robotic process automation, artificial intelligence, cognitive learning technology, autonomic platforms, and various scripting tools tied to enterprise software. What all of them have in common is the pursuit to enable automation for

business processes. In most cases the complexity, outputs, business value, and the amount of repetition determines what tools are the best fit for what.

2.4 Robotic Process Automation

Robotic Process Automation is defined by Institute of Electrical and Electronics Engineers (2017) as a “preconfigured software instance that uses business rules and predefined activity choreography to complete the autonomous execution of a combination of processes, activities, transactions, and tasks in one or more unrelated software systems.” While the inclusion of robot to the name often leads to connotations of physical robot being involved the name implies in this case to the nature of the software based ‘robot’ mimicking the human actions in the process being automated. This software robot can be infinitely scaled and able to operate around the clock.

By no means all processes or sub-processes are fit to be re-engineer for RPA. Process being automated using RPA software need to have strict rules and limited amount of deviations (Baranauskas 2018: 253). Because of this RPA has seen its strongest growth in back offices across different organisations, where such processes are often found. These back offices are the operational support for the existing core services. Such as human resources, customer service and especially finance & accounting. (Willocks & Lacity 2016: 42–43). From industry point of view it was telecom operators that were among the first industries to widely embrace RPA tools alongside financial service companies. This is because of the large scale of customer facing operations that share large amount of repetitive tasks and strict rules that made RPA very attractive early on.

This growth in back offices has been helped by faster implementation times compared to traditional automation techniques and RPA projects partial uncoupling from IT control closer to the business functions where the automation opportunities exists. Some of the

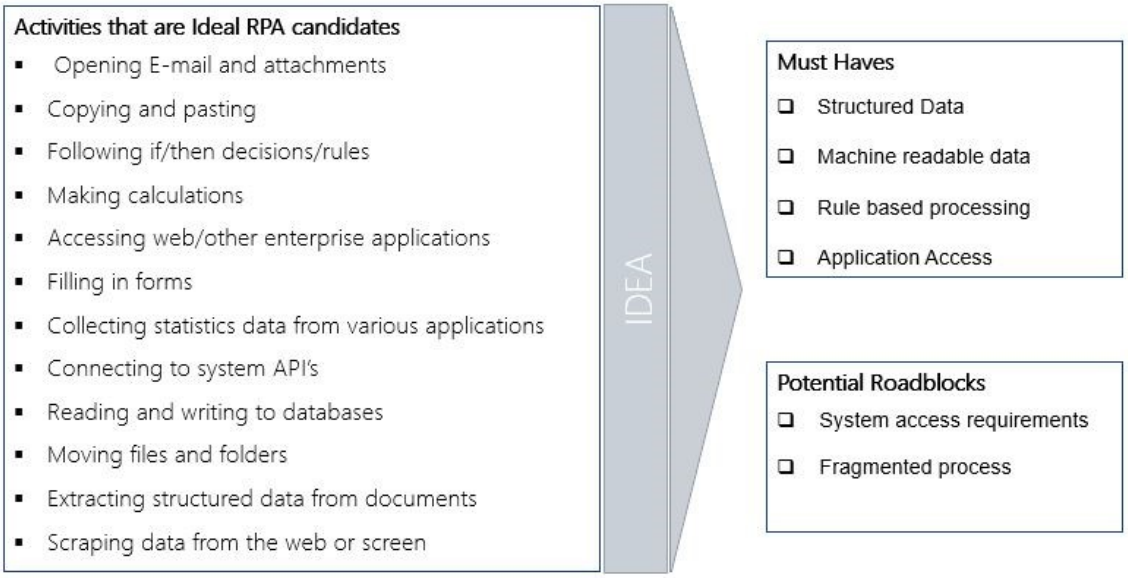
main drivers for faster implementation are low barriers of entry, as well as out-of-the box controls and toolsets. This low barrier of entry is especially crucial in understanding the growth of RPA. Legacy automation technologies need dedicated IT infrastructure, while RPA can be overlaid on top of the existing IT infrastructure. Most of the RPA tools can record users' inputs and mimic their actions. Consequently, RPA developers do not necessarily need to know any programming languages and training can be done in two to four weeks. This also gives lower barrier to customize the automation scrip later because of a process changes or to increase efficiency. Because of this RPA should be thought as more of a tactical tool compared to example BPA (Didion, Masri, Hernandez & Kaushik 2019: 1-2.)

2.4.1 Activities Most Suitable for RPA

While RPA can be new to many organisations long standing practices such as BPM, shared services and outsourcing can be for great guidance when determining what processes are fit to be automated using RPA. BPM because if its practises are already used in the company there is a swath of readily mapped processes that can be partly or wholly used to understand processes that are fit for RPA. Still, separate step-by-step guide will always be needed as the BPM process flow mapping use case and purpose is different.

Based on the case studies done by Leslie Willcocks (2016: 77) there are three major factors that usually make a process or a task good candidate for RPA. These RPA friendly processes also tend to be good candidates for outsourcing, or to be handed to shared services. As a first point, processes that have high volume of repetition, and high volumes also have the highest opportunity to reduce costs and be compatible with RPA. Second major point is the high process standardisation across the company and for the particular process. Meaning there is a good scalability and company's business units expect the same service across the organisation.

Figure 2. Common activities that are ideal for RPA project



Third major point is how rule-based the process is. High rule-based process means the process is easy to transfer to shared services because of lower knowledge transfer costs. These lower transfer costs stem from easier process mapping and guidance. Maturity of rule-based process is also a great help as it offers predictability, better documentation and process stability. Tacit knowledge would be the exact opposite to high rule-based processes. This would be hard to transfer because it is more experience and situation dependent knowledge – because of this transfer elsewhere would be harder and costlier.

When searching for cases that could be fit for RPA implementation, we can determine six basic attributes that work as a guideline when searching for processes to automate, no matter the RPA toolset that is available for the organisation.

1. Human factor

Processes that are high time consuming or require considerable manual effort. Mundane, repetitive, administrative tasks that take away valuable time from people on meaningful higher-value activities.

2. Nature of work

Highly rule-based processes that are easy to document and transfer. In an optimal case the process would also be mature – offering robust documentation, predictability and stability. Manual data entry processes tend to be prime candidates.

3. Input type

Input type should be standard in standard format. In practice this means the data is digitally readable for the RPA tool so it can scrape the data from the source. Some RPA tools can excel in different scraping data from different forms, like from web-based sources, but as a general rule RPA tools tend to have the most robust toolsets available for commonly used enterprise software and day-to-day business tools.

4. Process complexity

Process complexity can be a direct roadblock to automate a process. More complex process will always require more effort to automate. Complexity here means the number of steps in the process, how many hand-offs to different systems or human involvement needed, variation and the number of loops in the process.

5. Process stability

In this context the stability of a process means we do not expect to have frequent changes to the process because of external or internal reasons. It is good to understand the lead time for the change if the changes to the processes are predictable when redesigning the automated processes.

6. Straight through %

Processes with high first pass yield and accuracy are more suitable to be automated because these processes will have less exceptions. Focus should be put on seeing

the percentage of transactions processed without rework, exception or first pass yield metric.

Leslie Willcocks (2016: 149) found on case studies he conducted that many companies, even with mature RPA knowledge, where often too attached to already deployed RPA automations with too unambiguous rules. This then could bring a lot of additional work on managing exception handling and bring scheduling problems for the bots. Often this is driven by long manual process and the relating cost calculation that could seem attractive on the assessment phase. Especially so if the calculation heavily relies on average handling time, and complexity of the process is only included on the first yes and no business case decision to go forward with automating the process, rather than being integrated to the business case longer term cost and benefits calculations. As a general rule high and predictable volumes should be the main factor for driving automation business cases forward.

2.4.2 RPA Roles and Terminology

It is important to explain some of the RPA terminology as it tends to cause confusion especially with people that might work in IT already but are not familiar with RPA. Robot or a bot is a singular automation. In an on-premises or cloud RPA environment this would be one instance of automation running in a virtual desktop. That one bot can be scheduled to handle different processes or there can be a separate trigger that launches the bot to start automation process. RPA environment hosts usually tens of individual bots.

Primary reason for these potential misunderstanding's springs from same terminology and language that is already prevalent in IT can mean different things in RPA context (Willocks & Mary 2016: 74). Primary examples introducing this disconnect are RPA roles such as analyst, designer, and developer. This possible misperception of terminology can

lead into confusion on RPA projects being software development when that is not the case and give the image that people with RPA roles are doing the work of IT. Rather than trying to change the terms that have been standard in the RPA field for a decade now it is important to communicate these differences to people involved.

Business owner RPA developer will configure software on a particular RPA tool, whereas an IT developer is responsible on writing programming code. RPA analysts seek proactively automation opportunities inside the organisation and analyse the business process compatibility for automation. RPA analyst will be responsible on the main two RPA automation documents, that are Process Description Document (PDD), and the detailed Solution Design Document (SDD). Business analyst is typically expert in the business process, able to understand set of requirements that would be driven by IT for example.

Table 1. Basic RPA roles involved in RPA automation project

RPA roles	Description
Business process expert/Business owner	Owner from the business unit where the automation will be conducted. Responsible on creating business process definitions and mapping. Will decide from business on acceptance testing when the robot is ready to go live.
RPA project lead	Project manager for the automation and responsible on the automation being delivered in accordance to business requirements and RPA best practises.
RPA architect	Responsible on creating the RPA solution design and will provide support on the different solution documentations. Will oversee the development progress.
RPA developer	Developing the agreed solution in RPA software and communicating the technical implementation requirements. Recommended to be present as early as possible. Starting from the process walkthroughs.
RPA run & maintenance	Responsible on the RPA technical environment and technical incident management.

To expand on the table 2 on the RPA roles that are usually present when developing an RPA automation solution business process expert and business owner can be and often is separate person. Business owner will be committing to the full-time equivalent (FTE) impact or other key performance key performance indicators (KPI) from business to the project and will have the responsibility to give approval for the automation project. Business process expert will be more of a subject-matter expert. In mature RPA center of excellence there can be multiple more roles included in RPA projects than what is presented here. These will be explored in more detail when discussing about building internal RPA capabilities in chapter three.

2.4.3 RPA Software Providers

The RPA software variety has grown rapidly past five years and along the way created independent actors in the space, such as Blue Prism and UiPath that are valued in the billions of euros. Maybe a bit surprisingly some of the established software giants have been slow to enter the RPA market. We have seen more movement in natural language processing and machine learning from the usual suspects, such as Microsoft, Google, IBM and Amazon. This has started to gradually change recently with Microsoft joining the race in 2019 with their RPA branded solution and Redwood Robotics being acquired by Alphabet Inc.

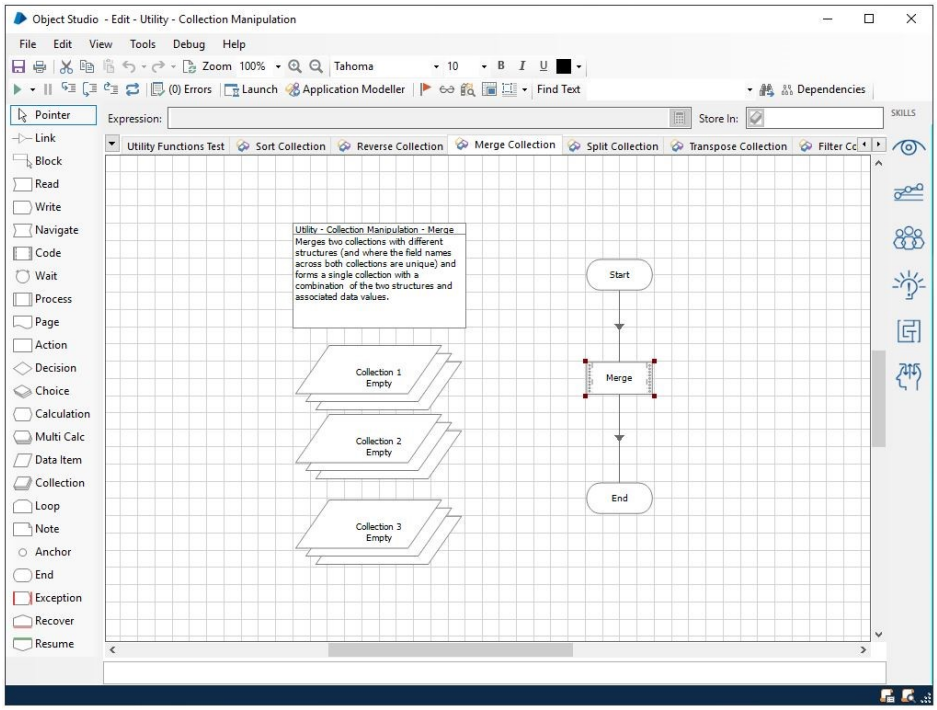
RPA tools can be divided at their very base level into two different groups. Assisted and unassisted automation. Assisted automation is also considered RPA 1.0 and it is an additional software running on employees work computer. Employee would be able to start the automation process on desktop at any time. This is especially useful where there might be long and complex process where the user can automate the task with one press of a button (Gupta, Rami & Dixit 2019: 159). Excel macro function would be

comparable as a concept, but with the distinction that comes with RPA where the automation can happen across several applications on desktop, rather than it being tied to function inside one application.

These days when we are discussing about RPA we are in most cases talking about unassisted automation. Unassisted automation means the user does not need to access their own desktop and start or close the automation process, rather the automation is running on schedule or there are predetermined triggers that activates the automation. This process automation queue is controlled from RPA dashboard where process priorities, scheduling of bots, completed tasks and errors can be tracked live. Unassisted automation delivers the possibility to operate robots twenty-four hours a day, seven days a week. From process design perspective unassisted automation will require more from project management to create clearly defined rules so human intervention can be minimized.

From a technological perspective we can recognise roughly four automation technology archetypes. The archetypes in order starting from the most structured data dependant to least so are desktop RPA, enterprise server RPA, professional IT software development, cloud RPA and lastly variety of tools that use preparatory layer to structure the data before automation (Willcocks et al. 2019: 14).

Figure 3. Blue Prism developer view (Blue Prism 2020)



Desktop RPA is partial automation or assisted automation where business and stakeholders are looking for deployment and lower barrier of entry for implementation. Enterprise and cloud RPA have the robots running on a separate environment and offer better scalability, as well as effective management to control the swath of robots working on tasks centrally. The question to keep the RPA instance on corporate servers or to have them in cloud on service provider will depend on the data the robots will handle, costs on scaling and changes on technology, as well as services requirements. Professional IT software development for RPA is what you more often see from organisations with strong know-how on software development or it is part of their core competencies. These companies might also have variety of legacy internal automation tools predating the turnkey RPA solutions that started to be more widely available in 2017. What variety of tool providers by service providers such as IBM Watson sough to offer is a preparatory layer using machine learning, natural language and variety of other methods to make unstructured data structured before moving to the final layer where

automation is handled by an RPA tool. These kinds of services are often marketed and packaged by professional service providers.

According to Gartner's (Ray, Villa, Tornbohm, Naved & Alexander 2020) research based on regional coverage and market position there are four RPA software providers holding the market leader position. These are UiPath, Blue Prism, Automation Anywhere and WorkFusion. Outside of WorkFusion all these software providers have remained as market leaders since 2016 on Gartner's yearly RPA report. UiPath, Blue Prism and Automation Anywhere are also different in that these software providers are focused on RPA, while the likes of WorkFusion, Winshuttle, Kofax, Infosys have multiple software products outside RPA. There are also IT or PBO service providers such as Syntel, Sutherland, Conduent that have their own proprietary RPA software platforms. Most of the academic research tends to focus on UiPath, Blue Prism and Automation Anywhere. These RPA software tools tend to be most easily found on larger organisations in some capacity. Gartner expects the RPA software market to reach $1.58 billion revenue in 2020 and $2 billion by 2021 with continued double-digit growth through 2024. Most of the growth is seen coming from large organisations expanding their RPA capacity, rather than new customers. UiPath, Automation Anywhere and Blue Prism are expected to keep their revenue lead till 2024 as well (Gartner 2020).

Figure 4. Gartner Magic Quadrant for Robotic Process Automation (Gartner 2020)

2.4.4 Emerging Automation Technologies

One of the main limitations of RPA relate to its incapability to handle unstructured or semi-structured data. Unstructured data characteristics include the lack of pre-defined data model and information being presented in rich media, such as video, audio or visual representation of a website. Semi-structured data does not usually follow strict tabular structure but will still maintain tags between elements. Web can be used as a example of semi-structured structure, as the data is held in files consisting HTML format that

holds structuring primitives with tags and anchors (Abiteoul 1997). Some RPA tools can fair better with semi-structured data by being specialized example on handling and scraping data from the web, but the data is either very specific or mined for very narrow purpose.

Different artificial intelligent techniques are being implemented for unstructured or semi-structured data to extract specific information from media rich information or to purposefully build structured data. These different artificial intelligent techniques include natural language processing, voice recognition, complex screen scraping, machine learning, and machine perception. Something that has been very visible to many people has been the increase of different chatbots across different web services. These chatbots simulate human conversation and ability to take unstructured data from a user and help the user to find the needed information. Large allure of chatbots is also on the output as the idea is often to create stream of structured data from the users of the chatbot. This structured data can then be example automated to some data stream using RPA solutions (Anagnoste 2018). There is a wide variety on the complexity of these chatbots available in the market from open source SDK and tools to multiple technologies layered services.

Hybrid automation technologies supplement the existing solution or solutions by mixing BPM, RPA, and different artificial intelligence technologies. This holistic model for automation is often called intelligent automation, or cognitive automation. We will refer this as intelligent automation for rest of this paper. These intelligent automation solutions can work as first layer to structure the data from images using machine learning or speech to text into format that RPA can use. These hybrid models can also be used to handle rare and expectation cases to provide required output (Kopec, Skorupska, Gago & Marasek 2018). Providers such as IBM with their Watson or Microsoft with host of different intelligent automation backend tools are some of the few wider solution providers in this field. These providers technologies can be used as standalone

or be integrated with existing RPA providers tools. Example IBM's Watson cognitive intelligent tools are used for cancer diagnoses where the system is fed possibly hundreds of thousands if inputs with varying level of structure coming from millions of pages of medical journals, medical evidence and other patient diagnoses information. At the same time there might only be few dozen transactions per day given to Watson.

On the horizon there are solutions that would fully integrate RPA with cognitive and deep learning solutions under one package. At this moment the different cognitive solutions can be integrated to some extent or are fully separate. In some ways this reminds of the early days of RPA before one package solutions and moving out of solutions clearly specialized to one narrow field of data scraping. Hope would be that these fully integrated solutions in the future would bring robots that could be more easily trained, rather than being programmed and more robust self-learning and computer vision functionality, as well as natural language generation and self-learning for process discovery for automations (Anagnoste 2018).

2.4.5 RPA in Finland

This paper case study interviews are conducted in Finland based companies. This context in mind it is worthwhile to look how RPA use across companies has evolved in Finland past years. According to Capgemini's research (2020) RPA as we know it landed to Finland in 2015, based on interviews and questionnaire that included thirty-eight companies based in Finland. These early adopters came from finance, IT, and telecommunications industries that launched their first reported proof of concept RPA projects already in 2014 and first live implementations in 2015. 2018 was the clear highlight year for RPA as 39% of survey respondents started their RPA journey then. Especially early on there were only a few tools that were driving the whole market in Finland. Part of the reason was the size of the market and the local support network that was available (Vehkaoja 2020).

In 2020, in a more mature Finnish RPA market over half of the RPA market is taken by finance industry. From business units it is the customer service that have seen the most benefits from RPA according to Capgemini's study (2020:12-13), as 68% of the responders saw clear tangible benefit. Accounting & finance came second at 66% and then there was a clear drop to 39% for human resources and production. Part of the reason is that the easy wins for RPA are often seen in finance & accounting and customer service. These two are the units where most companies will also start their RPA journey, and the know-how tends to be at its most mature.

2.5 Differentiating RPA from BPM

The ability for RPA to work in a process with multiple applications is one of the key differences it has over many other solutions that tend to work inside one application. RPA software solution providers have been able to deliver easy to use software suits with necessarily no need for programming skills – meaning the development can be carried mostly inside the back-office function itself. This has meant that the RPA software as a lightweight front-end solution is not usually wholly owned by IT like previous BPM solutions, and resources can be spread more inside the organisation. IT still certainly has a big role in aspects such as environment the RPA solution resides in or access rights management.

RPA is not be-all and end-all solution for automation. RPA cannot replace BPM when it comes to high value processes that need strong IT expertise and underlying changes to systems like Enterprise Resource Planning (ERP) or Customer Relationship Management (CRM) (Willcocks, Lacity & Craig 2016: 73).

Table 2. Comparison of RPA and BPM. Adapted from Forrester Research (2014)

Building a Center of Expertise to Support Robotic Automation

Attributes	RPA	BPM
Business goal	Automating existing process and increasing efficiency and improving output quality	Re-engineering of the underlying process to drive efficiency and improve output quality
Integration Method	Presentation layer integration reuses existing applications user interface, leveraging existing application paths	Data passed between new application and back-end systems, bypassing the established user interfaces
Developers	Experience in coding not needed	Software developers
Ownership	By the business	IT
Testing Requirements	Given that robots have the same capabilities as existing users, there are no requirement for additional system testing	Extensive additional testing required as data layer integration creates brittle interfaces between applications

3 BUILDING INTERNAL COMPETENCE FOR RPA

This chapter examines best practices for building internal capabilities for RPA in an organisation and the different ways companies have tackled with the balance of developing these capabilities in-house and outsourcing, as well as decentralised and centralised governance models. This chapter will introduce organisation models for RPA center of excellence and different key performance indicators (KPI) to measure automation project performance. It should be emphasized that the governance models discussed are for organisations that have hundreds of robots and maintain full-scale adoption for RPA.

3.1 Facilitating RPA in an Organisation

There are three organisational models for RPA: centralised, federated, and decentralised (Juntunen 2018). While there are definitive RPA organisations used in different companies that fall clearly to these models, the borders of these models when implemented are not as rigid (Brown & Grant 2005). There can often be differences on how the RPA organisational model appears in different business functions. This is caused by the wide contrast on needs and suitability of RPA automation in different corporate functions. Usually finance function plays a big role for RPA resources because of the large potential for RPA, while sales have less potential for traditional RPA and quick wins.

Centralised organisational model has the entire RPA capability under one point, that means center of excellence is created to house all this RPA capability inside the organisation. In practice this can mean there are core project leaders that then manage small project teams that are responsible on the different automation projects. These teams will be deployed from the center of excellence to business units according to the

RPA project pipeline (Noppen, Beerepoot, Weerd, Jonker & Reijers 2020). Project leader and business unit involved with an RPA project are heavily involved when identifying automation ideas, as well as ranking them for the overall RPA pipeline that will involve schedule and assigning of resources. In centralised model the expectations would be that center of excellence is responsible on creating the governance documentation, training, and different tools such as automation identification tools and tools for business to prioritise their automation ideas. Centralised model at its best can offer one point of contact with wide knowledge base from leading RPA projects to strong operational knowhow helped by the build knowledge in one place for easy information sharing.

Table 3. RPA organisational models compared

Characteristics	Centralised model	Decentralised model	Federated model
RPA Center of Excellence	One center of excellence for the whole organisation	Each business unit holds its own center of excellence. No centralised center of excellence	One center of excellence for the whole organisation. Delivering automations are federated to business units
RPA maturity level best fit for the model	Developing RPA capabilities, Mature RPA capabilities	Developing RPA capabilities	Mature RPA capabilities
Main benefits	One point of contact for all RPA capabilities, clear roles, knowledge sharing, easier to implement governance	Empowering business units, not directly competing for resources	Scales well, stronger sense of ownership, knowledge sharing, not competing against other projects on automation delivery
Main disadvantages	Business units compete for the same resources, single point of contact in a large enterprise can be lost and lead to duplicated efforts	Lacks the end-to-end view for processes, can duplicates efforts, lack of centralised governance	Harder for smaller organisations to fully implement federated model

Decentralised organisation model is the other extreme to centralised model where all RPA capability is housed inside the various business units. There is no governing body for RPA that would be able to coordinate resources and prioritise projects across different business units. Osmundsen, Iden and Bygstad (2019) found main advantages of decentralised model on their RPA study conducted in an energy company to be the enthusiasm in the business unit as the owners of the RPA development pipeline and more hands-on experience about developing robots. Osmundsen et al. (2019) also observed in their research that it was easier to involve process experts and owners in the different business units when there was local ownership. Some significant downsides were found to be on the lack of company-wide resource coordination and on the lack of company-wide push for the RPA initiative. Decentralised model also lacks the end-to-end view for processes and can focus only on a sub-process, while there could be much larger automation potential.

Federated organisation model takes aspects from both decentralised and centralised approaches. From decentralised model federated model retains the local ownership for the RPA projects, where each business unit develops its own robotic delivery function but tries to avoid many of the pitfalls of decentralised model by introducing RPA center of excellence. These local RPA ownership hubs will handle identification, periodisation, robot development, support for bots in production environment, and the local hub change management. This RPA center of excellence in federated model contains usually small group of people that will be responsible on defining the general governance guidelines for RPA, work as central location for training and enabling people to take part in RPA projects. In this model the center of excellence company-wide automation strategy and a technology solution holder role are especially highlighted (Beereepoot et al. 2020). Automation strategy will come through how information is shared across the company, as well as from templates and tools used to set the general framework to identify and select opportunities that are fit for automation. These tools will be in central

role on how the business units will define the program metrics and measure value realisation.

Federated model can work well in a mature RPA environment, where the use of RPA has permeated outside the usual RPA stronghold business functions and there might not be critical mass of opportunities for a proper local RPA hub. In these cases, development and support help can be acquired using the help from center of excellence, that will then carry over the standard operating and governance models, as well as tools, and resources in form of internal and external for design and development phases. Some challenges relating to the federated model come from the nature of go or no-go decision gates in different stages of RPA projects being held by center of excellence and the local hubs. Also, the relatively small size of center of excellence can pose challenges if the scope is not properly built (Kämäräinen 2018).

3.2 RPA Center of Excellence

Leslie Willcocks (et al. 2015: 178) in his study found that RPA can be deployed successfully to organisations in federated, decentralised, and centralised models. What defined the right organisation model at the start is what fits the organisations culture, size of the initial deployment, and structure. Problems start to arise after siloed RPA operations have taken the quick wins in its function or whatever location RPA has been confined into initially. How does one control the software platform and stop duplicating processes when starting to scale up RPA wider in the organisation?

RPA center of excellence can be of a great help to the organisation in this scale up process across organisational boundaries. It can help imposing same standards and maintaining them across different functions. Having well thought out plan on how to spread information about RPA is crucial on do people see RPA as a threat or something

to be excited for. Getting people participate on reporting processes, building the RPA project pipeline, and taking part in developing automations can determine the long-term success of RPA in the organisation.

While there are clear benefits for implementing RPA to the organisation, it is good to remember that implementing such model can still have its own problems. It could be that in a decentralised model the owning hubs or silo experiences strong ownership in the RPA implementation. RPA can have started in various ways, example as passion project by couple of people in the organisation without C-level involvement or strategy. If no central structure exist it will always be a material investment and cultural shift (Willcocks et al. 2015: 178). Willcocks (et al. 2015: 179) also argues that center of excellence alone is not enough. There also needs to be a champion for RPA in the organisation to drive reporting and managing RPA success stories to the higher management. This role is often called Head of RPA or Head of Robotics.

There can also be direct cost savings from bringing RPA platform under one maintained license for the organisation to have more muscle on the license negotiations with the software platform provider. Relating to direct cost savings, having centrally located visibility to the whole RPA software platform to better schedule tasks operated by software bots will give much better to optimize the use of RPA software tools, such as Blue Prism. This can bring direct savings to the license holder as the amounts of near twenty-four hours a day running bots can be reduced (Asatiani, Kämäräinen & Penttinen 2019: 6).

We can organise RPA center of excellence into different stages on how far the organisation is on brining RPA as part of its culture and tightly knit to its everyday work, across the whole organisation. In the first phase RPA can still be siloed inside a function and there is no wider convergence of RPA initiatives. What does already exist is robust operating models, functional project pipeline and general experience inside the silo or

silos of RPA in the organisation. On the second step we can now see the convergence among the different RPA initiatives taking shape. This is when the aforementioned benefits of center of excellence start to appear. There is now central point and point of interest inside the organisation for RPA.

Table 4. Creation of RPA Center of Excellence framework and capability stages

RPA Center of Excellence stages	
1. Diffusion of RPA concepts and benefits	Provision of tangible and robust RPA methodologies, techniques and tools to be able to execute RPA projects.
2. Creation of convergence among RPA initiatives	Creating alignment, governance, and convergence of all RPA-related services (opportunity pipeline, design, develop, run and maintenance). Central ownership for RPA. RPA CoE is now the trusted owner of RPA capabilities and the main contact point.
3. Strategic alignment and RPA culture	RPA services linked to the corporate strategy. Business might be able to handle the RPA projects by themselves. RPA portfolio management is established discipline. A proactive approach where projects are consciously selected, rather than the following reactive model.

Lastly there is strategic alignment going across the organisation on RPA. This means C-level is supporting and taking RPA part of the strategy. Lifting visibility of RPA across organisation and hopefully bringing it as part of the culture. Center of excellence should not concentrate on finding projects to automate, but rather having well defined and maintained project pipeline, that is able to respond to well described and scored ideas being send across the organisation. High trust on RPA center of excellence being able to respond and deliver.

3.3 BPM and RPA Role Within IT

RPA and BPM do not directly compete against each other, rather they are complementary (Forrester Research 2014: 2). Both are suited for different solutions and both require different IT involvement. While there are distinctive differences between the two solutions the challenges they both face are often similar, such as focusing too much in short-term fixes, underlying IT capability, project management, delivery & tracking, access right control, and building internal capability. These points will be more deeply discussed on the next chapter and on the example cases.

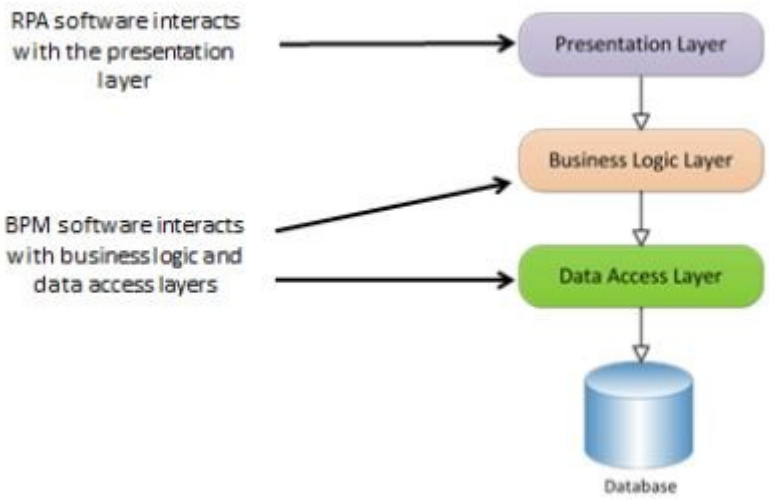
The premise on which solution to choose is most dependent on the business goal. If the business goal is to reengineer a process BPM should be used, while RPA is best suited when you are automating existing process. Process being automated using RPA is nearly always reworked to fit the tool or to optimize the process for RPA, but the actual business goal is not usually to reengineer the process. From a technical outcome perspective BPM will create a new application, while RPA will use existing application. From development perspective RPA process automation project is usually carried by one developer and the developer depending on the complexity can complete the automation project in couple of days. In RPA vocabulary RPA developer configures RPA software. RPA developer does not write programming language. This is a good distinction to keep on mind when we are discussing about RPA developers and IT developers to not mispresent the terms (Willcocks et al. 2015: 14-15). Without the need of programming background, it is possible to train RPA developers inside the business units in matter of weeks, as long as the business sees the RPA project pipeline being wide enough for the particular business unit to do so. From testing perspective BPM nearly always require system testing. RPA testing only requires output verification done in cooperation with business on user acceptance testing.

3.4 IT Department's Role in RPA

One of the usually brought up benefits of RPA is the inherent nature of RPA being lightweight IT installation, that should be quick and inexpensive to deploy. The term "lightweight" in this case means RPA software does not interfere with underlying computer systems and is a front-end application. In most cases RPA is implemented on top of existing information system found already in the organisation. BPM solutions would be an example of interacting with data access layer and business logic. The sold promise to business units is the fast deployment and promise of low investment for high returns. (Asatiani, Kämäräinen & Penttinen 2019: 5-6).

Another promise usually given with RPA is the governance and development being shifted at least partly to business units, compared to traditional IT solutions that would be led by an IT department. This brings interesting questions on how RPA governance and responsibilities should be spread out and distributed in the organisation. John Hindle's (2019: 8) research shows that common mistake companies do is decoupling RPA governance from IT too far and only adopting common project management techniques. This comes from RPA being treated as just another piece of software inside the organisation and not signing into a proper governance arrangement in accordance with the access of data RPA has. IT can become a bottleneck for RPA operations if no proper resources exist in IT to support RPA and if IT is too far decoupled for it to scale alongside the RPA. This is especially dangerous when RPA starts to scale as organisation wide tools from the initial launch function.

Figure 5. RPA and BPM interaction with IT system layers (Willcocks 2015: 8)



In case studies conducted by Willcocks et al. (2015: 147) it was shown that eradicating IT steering group from the final decision making for individual RPA projects did streamline the process considerably and did let business to make their final decision RPA project pipeline. Involvement of IT as early as possible was seen beneficial so IT can evaluate access rights and systems involved with the automation being planned. Later in the following chapter we will go through some example cases that show possible models for IT involvement in more detail, and what have been the lessons learned on how IT has been involved on RPA governance and projects.

3.5 Performance Metrics for RPA

RPA as with any other tool needs to constantly proof inside the organisation why the expenditure is justified. This usually means establishing set of metrics that visualises the benefits that are being realised. Metric is the general term, while KPI is specific term for metric that is specifically highlighted as critical. This KPI could be measuring organisation

or an individual performance in an operational, strategic, or tactical activity that is seen critical now or in the future (Kerzner 2017: 122). When trying to find the right KPIs the characteristics in academic literature are often boiled into the "SMART" rules to identify these characteristics (Zhu 2015: 3)

Table 5. Overview of the SMART KPI characteristics (Kerzner 2017: 9)

SMART KPI Characteristics	
Specific	The KPI is clear and focused towards performance targets or a business purpose
Measurable	The KPI can be expressed quantitatively
Attainable	The targets are reasonable and achievable
Realistic	The KPI is directly pertinent to the work done on the project
Time-based	The KPI is measurable within a given time period

RPA has helped companies find significant economic benefits, but far too many also treat it as a silver bullet and especially struggle when it comes to scaling RPA from the initial proof of concept (Shojai 2017: 109). There is a lack of studies done relating to use of different KPIs on RPA. Even so, full-time equivalent (FTE) is the dominant KPI that is repeated by the RPA software tool providers and service providers. FTE is defined by Eurostat (2020) as follows: "FTE, is a unit to measure employed persons or students in a way that makes them comparable although they may work or study a different number of hours per week".

Why FTE comes up so often is easy to see as RPA is still somewhat new concept for many organisations and FTE is something more tangible IT or other business units can sell RPA to the steering groups and executives who are responsible on managing budget. FTE also has the benefit in that it fits to the widest amount of individual automation projects as the primary KPI. Organisations still need to be careful on how it markets RPA internally

before it is deployed considering this emphasis on FTE. Overwhelmingly the messaging for RPA tends to be to highlight that the aim is not to replace people by automating tasks, but rather eliminate manual repetitive mundane tasks and free employees to focus on something more meaningful.

Another important aspect about RPA is the quality aspect. Depending on the nature of the process automated the KPI could relate to how quickly RPA is able in average to resolve a request or issue. This could be directly customer service related or how quickly bot is able to confirm an order. Measuring the amounts of error per workflow bot does compared to human.

4 METHODOLOGY

Section in question will start by explain the used research strategy and methodology. This will be followed by the data collection methods, and lastly discussion on limitations of the data collection and research strategy of the study.

4.1 Research Methodology and Strategy

The importance of properly laying out research methods is not just important for the reader to understand the basis of the study and critically evaluate it, but poorly done work on research methods can hamper knowledge being built on top of prior knowledge (Campbell 2000: 224).

The chosen methodology of this study is qualitative method, that is used as the wider data collection method for this study. Qualitative research is in its core about collection, analyses, and interpretation of rich empirical material. Compared to quantitative research that focuses on collecting and shaping data into numerical forms for statistical calculations to draw conclusions. (Habib, Pathik & Maryam 2014: 9). The three most commonly used qualitative data collection techniques are focus groups, observations, and qualitative interviews. Qualitative research is described by Strauss and Corbin (1998) to be type of research that does not acquire its findings from statistical procedures or means of quantification, rather qualitative research puts emphasis on cases and context.

Case study focuses on dynamics within single settings and can include multiple levels of analysis within single study. Case studies can be considered as theory building or to affirm a theory and seeks to answer “how” and “why” questions. Conclusions tend to be

by their nature bound by time and place. Case studies tend to spread into multiple data collection methods. These methods can be interviews, archives, questioners, and observations. Goal is that the data collected would enable the data to be triangulated to get as rich as possible description for the phenomenon being studied (Yin 2013: 4). The evidence presented in the case study can be quantitative, qualitative or both. (Eisenhardt 1989).

This research uses explanatory case study as the research strategy to examine how RPA operating models have evolved over time in mature RPA environment, how companies have approached internal capability building for RPA and what kind of roles are being established in a cross-functional setting in a mature RPA organisation. All companies involved in this research have had at least two years since their initial RPA project launches to further examine best practices for RPA in the organisation. There are three types of case studies: descriptive, exploratory, and explanatory. All these case study types are used for different purposes and will answer to different questions (Stake: 1995). Explanatory case study is best used when questions such as “how”, “what”, and “why” are being asked. This means explanatory case studies do not have pre-determined outcome, rather it is used to investigate specific phenomenal that lacks preliminary research. Explanatory case studies can be used to explore presumed causal links seen too complex for experiment. Explanatory case study, and case studies in general having multiple cases allows comparison that then can lead to a stronger theory building. Exploratory research seeks to explore new ideas and concepts to help researcher to form initial hypotheses on the subject. Before starting an exploratory research, the researcher starts with conceptual model, empirical evidence, and hypothesis (Habib, et al. 2014: 8).

4.2 Data Collection

The primary data collection method is done using non-standardised semi-structured interviews that makes it possible to compare the studied organisations. While the interviews are standardized it is typical for semi-structured interviews to vary (Miles & Gilbert: 2005). Interviews in this study use a template included in apendix 1 to make sure all the relevant questions are answered. Semi-structured interview makes it possible to change order of questions or depending on the answer, to further examine specific dimension of the research questions (Kuada: 2012).

In a semi-structured interview, the interviewed was made aware of the topic and the central questions of the particular topic beforehand. Providing information about the central questions was important to ensure the interviewee would have comprehensive visibility to the organisational structure and history knowledge to RPA in the organisation, as there is an historical component to evolvement of RPA capabilities in the organisation in the study. Main reason for using semi-structured interviews as means to collect data relates to RPA still being relatively young and the mounting experiences changing best practices around RPA. RPA environment is very dynamic because of the RPA software environment evolving quickly, as well as the honeymoon period for many organisations in more mature stages of RPA implementation being over.

One interview was recorded and for the rest notes were taken. Interviews were conducted virtually due to prevailing COVID-19 situation in Finland. Interview length varied between 55 minutes to 135 minutes. In total six people were interviewed and when possible taking other people from the organisation to take part on the interview to kindle further discussions on the topic. Interviewee were also asked to share possible RPA organisational mapping and supporting material. The needed historical high-level knowledge on RPA in the organisation did unfortunately rule out many potential

candidates for interviews. A lot of good discussions would usually arouse from having person who had been part of building RPA in the organisation and a person who had come later to oversee RPA development in the organisation. Due to the companies revealing their RPA tools and organisational models it was asked that the companies names would not be disclosed in this paper.

4.3 Limitations

Interviews being used as primary data collection methods can create data quality problems. Most common being bias, proof of validity and generalisability. These data quality problems can be most prominent in semi-structured interview (Kuada: 2012). Interviews can introduce reporting stability and internal validity problems. Internal validity asks how much there is actual evidence that supports the answers given. Reporting stability refers to long-term stability of the interviewee's answers. Validity of the answer can be constrained to the reality of the case organisation and is always somewhat time-dependent to when the interviews were done (Price & Murnan: 2004). While the companies that and personnel that took part on the interviews were asked to be kept anonymous, there is a possibly interviewees did not respond truthfully to the questions and gave more positive appearance. This is especially relevant in this paper as the questions often relate to the interviewees performance on managing and building structures relevant for success in the field.

5 EMPIRICAL WORK AND ANALYSIS

Interviews for the empirical part of study were conducted in four Nasdaq Helsinki listed companies. All the companies involved have their headquarter in Finland and have annual revenue over one billion euro. Four of the companies are involved in heavy industries and one is a technology company. People involved in these interviews have asked their names and companies to be kept unnamed to protect their privacy. These four companies will be referred by aliases' Antioch, Ravenna, Ephesus, and Amorium. Outside of Ephesus all companies were using at least one of the three RPA software classified as leaders by Gartner's magic quadrant for Robotic Process Automation. These three RPA tools being UiPath, Blue Prism, and Automation Anywhere (Gartner 2020). Ephesus had selected only one tool that was used across external and internal automation projects from one of the Gartner's magic quadrant niche players.

Table 6. Companies and roles of the interviewed

Company	RPA
Antioch	Head of Finance Development RPA Governance Manager
Ravenna	RPA Specialist
Ephesus	Senior IT Manager
Amorium	IT Lead Architect RPA lead

5.1 Company Introductions

All companies involved on the interviews have one-billion-euro annual revenue and over thousand employees globally. All companies also have their headquarters in Finland and are listed on Nasdaq Helsinki.

5.1.1 Antioch

Antioch is a Finnish industrial company listed on Nasdaq Helsinki. Over 50% of its workforce is located in Finland, including most of its back-office operations. Antioch has been using RPA since 2017 and uses UiPath as its main RPA tool in an on-premises solution.

Figure 6. Antioch RPA profile

Antioch (decentralised)	
RPA Center of Excellence	No center of excellence.
Control of RPA project pipeline	Business hubs control their own project pipelines.
Role of IT in RPA	Limited to the technical RPA IT infrastructure management, infrastructure support, and access rights.
Number of bots deployed	Over 100 bots deployed globally.

RPA is part of finances strategy, but not elsewhere in the organisation. RPA was driven by finance when deployed and it also the function that still owns the resources relating to RPA. Including three full-time developers. There is no established center of excellence

in this decentralised model where business hubs carry full control on everything outside of RPA IT infrastructure that is managed by IT. Finance holds control on RPA platform and significant know-how. Often this means that finance works as a knowledge hub when other functions start considering RPA solutions. RPA has also a strong foothold in Antioch's sales function that holds around 20% of all deployed bots.

5.1.2 Ravenna

Ravenna is a Finnish IT company listed on Nasdaq Helsinki. Back-office operations are located across the globe, with only very small portion located in Finland. Finance has much of its operational back-office work located in Eastern Europe. Packaged RPA has been used since 2016, but there is much longer history of similar to RPA internal tools, that are still being developed. These internal automation tools are not part of the study and are positioned in totally separate teams from RPA under shared services function. Main RPA tool used is Blue Prism and primarily an on-premises solution.

Figure 7. Ravenna RPA profile

Ravenna (federated)	
RPA Center of Excellence	Recently established center of excellence.
Control of RPA project pipeline	Center of excellence controls and maintains project pipeline.
Role of IT in RPA	Limited to the technical RPA IT infrastructure management, infrastructure support, and access rights.
Number of bots deployed	Over 800 bots deployed globally.

Finance and shared services started with multiple independent RPA projects initially in 2015 and 2016. In 2018 RPA was included into finance's strategy and new center of excellence was established under federated model. Center of excellence controls the organisation project pipeline, RPA platform, training, information sharing, and has its own resources for all roles. Project lead comes from center of excellence or couple of the established hubs in finance and shared services. IT manages RPA IT infrastructure, infrastructure support, and access rights There are over 800 bots maintained on the on-premises solution, but this number does not include some of deployed by Ravenna's partner. In total over 1300 FTE's has been saved.

5.1.3 Ephesus

Ephesus is a Finnish industrial company listed on Nasdaq Helsinki. Back-office operations all located across the globe, but mainly in Finland and Eastern Europe. RPA proof of concept was deployed in 2017. Ephesus uses Kofax RPA primarily as on-premises solution.

Figure 8. Ephesus RPA profile

Ephesus (federated)	
RPA Center of Excellence	Strong centralised center of excellence.
Control of RPA project pipeline	Business hubs control their own project pipelines.
Role of IT in RPA	Technical RPA IT infrastructure management, infrastructure support, and access rights. Center of excellence located in IT department.
Number of bots deployed	100 bots deployed globally.

RPA deployment was started from IT department and the center of excellence is still maintained under IT. Some of the other strong RPA business hubs are located in finance and procurement. Center of excellence controls training, information sharing, and delegates resources to projects when needed. Finance RPA hub is the only hub with its own developer resources. Over seventy people have gone through introductory training for RPA and the tool to improve the ability for people to recognise tasks that fit RPA. There are also over twenty people have been trained to design and document new automations across the organisation. Ephesus has deployed 100 bots, resulting into estimated 50 000 hours saved a year. Ephesus maintains phase of at least four bots being deployed monthly across the organisation.

5.1.4 Amorium

Amorium is a Finnish industrial company listed on Nasdaq Helsinki. Back-office operations all located across the globe, but mainly in Finland. Primary RPA software tool is UiPath as on-premises solution.

Figure 9. Amorium RPA profile

Amorium (federated)	
RPA Center of Excellence	Center of excellence as a coordinator. Does not manage resources.
Control of RPA project pipeline	Center of excellence maintains project pipeline.
Role of IT in RPA	Limited to the technical RPA IT infrastructure management, infrastructure support, and access rights. Reports to RPA center of excellence.
Number of bots deployed	Over 150 bots deployed globally.

RPA was first deployed by IT led proof of concept in 2016. After launching initial proof of concept federated model was established quickly after. Center of excellence controls the RPA software platform and the relating licenses, as well as coordinates training and spreading information on RPA. One single project pipeline is maintained under center of excellence. RPA business hubs still carry considerable weight on deciding prioritisation on project pipeline. Hubs also manage all the process design and developer resources internally. Amorium has over 150 bots deployed across the organisation and it seeks at least one FTE savings for each automation project.

5.2 Quality and Time Saving Aspect

Time freed by RPA and the saved full-time equivalent (FTE) used to measure this is the first KPI that is brought up. FTE is the hours spend of full-time employee in a fixed time period. This is then compared to doing the task manually and the saved hours of automating the task. FTE can bring often negative connotations and fears of becoming redundant, especially to people involved on the processes being automated. In Ephesus case the internal tool used to determine suitability of the process for RPA has FTE calculation, but the FTE result is not shown to the people filling the process assessment – that includes hours spent. Still, Ephesus alongside other companies interviewed mentioned they have not laid off employees due to RPA, or see RPA being used for that purpose. Ravenna had made over hundred FTE savings in relatively short time when RPA was being deployed to the company. These big savings were able to be achieved because of large amounts of repetitive manual work that had been introduced some years earlier in the result of a merger and needing to maintain two separate backend systems for transition period. Much of this tedious work had been moved to RPA in one year's time and freed large amount of people to do more meaningful tasks. Especially in the finance

organisation this had been very welcome change and gained excitement and wide support for RPA early on.

> *FTE is a primary KPI for us, but it should not be the only one. There has been a lot of benefits from people engaging on process development internally. These unfortunately are not easy to put into number (Antioch, Head of Finance Development.)*

In Ravenna two FTE's was seen as the minimum amount for the process to be considered for automation at all. Internally coordinated resources Ravenna had deployed over 800 bots resulting into 1300 FTE's being saved. Amorium and Antioch are aiming for two FTE's, while lower FTE count does not present a clear roadblock for the automation project to go forward. For Amorium project resulting into lower than one FTE was still a clear roadblock. Ephesus due to its lower cost structure on the RPA tool saw one FTE as acceptable, but even lower than this would not still block the project from consideration. Ephesus had seen already 50 000 hours saved a year from the 100 globally deployed bots. After business had presented its case the final decision would be made by IT governance steering group to start developing the automation project. IT steering group was not involved on any of the other companies' decision making for individual automation projects, rather it was always up to business to continue or not. Having IT's input is still important at the very latest on solution design proposal, when the required systems and access rights required for the automation are known. Hope would be that this discussion with IT would happen before the solution design is presented.

RPA's core aim is on removing dreary, repetitive, and simple tasks by automation, and freeing people to do more meaningful tasks, but there is also relating component of increases engagement levels when deploying RPA seen by all companies studied. Functions where RPA was clearly deployed saw more interest across the employees in the function in developing existing processes and people feeling they can directly influence their own workload. Different trainings starting from internal training that

explain surface level information about what nature of RPA – to preparing process experts to prepare process design documents and do the walkthroughs of the manually done work to RPA architects and developers. Often this producing the process design documents is the person doing the manual work. Even open trainings for people in the function to be process architects, that would then be able to produce the solution design document that would be directly translated by the developer into automation. This involvement of the people directly in the business from the people doing the manual work is important. Rather than there being heavy IT project in the background that would be mostly invisible to people involved directly in the process, now people felt they were able to directly influence the end product and be part of the change process.

> *We have built specifically for some bots a quality KPI. This measures how many errors the bot has found and fixed. This is a recently developed KPI we use in some HR bots (Ephesus, Senior IT Manager.)*

Service availability, customer satisfaction and quality were also seen as visible benefits. Often purchasing and sales organisations saw improvements on service availability and third-party customer satisfaction increase as orders and order confirmations could be send right away. For Ephesus sending orders and doing order confirmations had been among the first projects RPA had been used for. Letting purchasing and sales organisations to focus more on serving customers directly by doing less high transaction manual work. There being observed less errors is more universals across different functions when using RPA, as mundane repetitive tasks that can have thousands of transactions a day done by large amount of people is fertile ground for such errors. For Ravenna quality was very important as the scaling up of RPA operations came from needing to maintain two backend systems after a recent merger. Any occurring errors on transferring information between these two backend systems would be multiplied later in reporting and many other processes that would involve the master data being combined.

5.3 From Proof of Concept to Building RPA Organisational Model

All the companies being studied had their first RPA proof of concept deployed at latest by 2018 and organisational model had been implemented for RPA operations. There were still differences on the maturity level of RPA as a whole and how widely RPA was used in the different functions of the organisation. Finance function tended to have the most automation projects and had the longest history on implementing RPA projects. On all companies studied center of excellence resources were a collection of people from finance or IT function. In the case company Antioch and Ravenna finance had been the function that took the first steps to deploy RPA to the company and held most of the relating resources. On the case of Amorium and Ephesus IT was the function that had started the development of RPA in the organisation.

> *IT facilitates it [RPA] and functions take the lead on deployment. Managing processes and environment are under IT. RPA is an operative tool for functions and the aim is to give more responsibilities to functions going forward. (Ephesus, Senior IT Manager.)*

There was a clear desire to have the design and development capability internally, as well as keep growing these resources. Especially internal solution architect and as-is process mapping resources were seen crucial. Experienced solution architects could carry helpful information about the end-to-end process in the organisation to see weak points and could suggest further automation. Redesign conducted by solution architect was seen important to speed up the whole robot development process, as this would ensure clearer instructions to developers and better flexibility in case of changes needed to be done later. Also, being able to streamline the process in the redesign phase and create more stable bots.

Apart from Ravenna all companies taking part on the interviews had taken steps from the start to build strong base for internal capabilities on RPA to be able to deploy

software robots without outside help. This was often not the whole organisation wide, but rather at least for the functions that saw most automation opportunities from the start. This would usually include finance, procurement, and some other operations heavily tied to the industries the companies are involved. Consultants or the solution providers had been closely helping on deploying the RPA software and with the proof of concept. This help usually also extended to doing interviews and mapping promising prospects for automation outside of just proof of concept for the company to continue independently after proof of concept. Help would also extend to tools for managing project pipeline and evaluating automation candidates that could be used internally. At times, such best practices and tools could be provided by the RPA software provider directly as well. Amorium and Antioch still had significant portion of third-party RPA developers that were under center of excellence. Mainly finance function had its own RPA developers as resources. All the as-is processes mapping related resources were already internal at least on the functions that saw the main volume of automation projects and bots already in the production environment.

Ravenna had RPA hubs that were often competing for the same internal customers without any center of excellence. This was a result of decentralised organisational model for RPA that had grown organically over the years without central higher management push. Recently there had been steps to change this and create center of excellence for RPA after automation had been added to the finance functions strategy.

> *Software automation had been included in finance strategy recently [2019] and this had worked as spark to start building center of excellence for RPA. Center of excellence would manage the overall pipeline, instructions, software licensing, creating operating model, and have its own development resources. For us the most important aspect is to remove the overlap and get better grasp on governance to better control costs. (Ravenna, RPA Specialist.)*

Ravenna had moved towards federated model, where hubs inside finance function would still hold relatively strong autonomy and control their own project pipeline and developer resources. RPA center of excellence would take control of RPA IT resources, RPA target operating model, creating best practices for RPA in the organisation, responsible on RPA information sharing across the organisation. Also, some more nuanced aspects such as building centralised location for RPA scripts and pushing for more modular way of developing bots. It was also seen important for center of excellence to take ownership on the RPA software and the directly involved internal and external IT resources. In Ravenna this was also hoped to help on scheduling of bots – that is an important part on optimizing the amounts licenses Ravenna needs to pay to the RPA software provider.

Antioch was maintaining decentralised model. Each hub is responsible on their target operating model, resources, project pipeline. IT maintains RPA software platform, IT infrastructure, and access rights. RPA hub in finance was unofficial center of excellence as it is the only hub that has full time RPA resources and by far most of the experience on RPA in the organisation. This was reflected by finance usually sharing information across hubs, but in general getting the needed resources were up to the other hubs. Developers and other full time RPA resources in finance were directly under finance and these resources were not used elsewhere.

5.4 Roles and RPA Development Phases

This section investigates general phases of developing automations and roles involved for Ravenna specifically. Ravenna had moved from decentralised organisational model to federated mode, with organisation-wide center of excellence. This had meant

creation of new roles and bringing together learnings and different tools, as well as operating models from the previously competing hubs from different functions.

5.4.1 RPA Roles

Roles presented here are mostly from the point of view of developing automation under the RPA organisation. Especially RPA lead that is usually positioned inside the center of excellence, and head of local RPA hubs have wider responsibilities in managing project pipelines and competency development inside the function or the whole organisation.

Process owner is often leading the sub-function and line manager to subject matter expert. Process owner is responsible on doing the very first assessment and business case that would be send to RPA center of excellence to be included in the project pipeline. RPA steering group will then give the decision if the project moves from assessment to be developed and attached to the project pipeline. Process owner will ensure subject matter expert is available for the development and RPA lead in the center of excellence will ensure all resources are available by scheduling the project in the organisation wide project pipeline. Subject matter expert is in most cases the person doing the manual work for the process being automated. Ravenna's case it is often subject matter expert that also suggests for the process to be automated initially.

Table 7. Roles when developing automation in Ravenna

Phase	Roles	Responsible
Identification	**Process Owner**	User acceptance sign-off, business case creation, final go live sign-off
	RPA Steering Group	Budget approval
	Subject Matter Expert	Opportunity identification, process design document, solution testing, test scenarios
	Head of Local RPA Hub	Training, license to operate sign-off
Development	**RPA Lead**	Project pipeline prioritazation. Opportunity selection sign-off
	RPA Architect	Feasability estimation, solution design document, code review
IT	**Run Support and IT Assurance**	Access right management, systems assessment, RPA IT infrastructure
Center of Excellence	**Facilitates RPA Organisation Wide**	RPA platform, resources, project pipeline, training, maintains target operating mode.

Local RPA hub and its lead is tied to function, but not all functions have RPA hubs. Depending on resources RPA lead and head of local RPA hub can be the same person. In most cases Ravenna strive to use person from the center of excellence as RPA lead. This is to ensure center of excellence has good enough understanding of each project's development, as well as to ensure good communication with IT is kept up and target operating model is followed. RPA architect is already taking part in the identification phase of an automation candidate by giving the feasibility estimate. RPA architect's main contribution is the solution design document. This is the document that suggests the implementation method for automation. Solution design document also considers the systems involved, access rights, process exceptions, scheduling, process triggers,

monitoring, and data security. RPA architect, alongside RPA lead tries to bring together the technical requirements and businesses' needs.

IT's role is mainly involved on maintaining the IT infrastructure for RPA in Ravenna. This also includes ticketing systems for any possible IT infrastructure related problem cases that reflect RPA operations. Center of excellence as the RPA software platform holder for the whole organisation will maintain constant dialogue with IT on this part. IT is involved on the individual RPA projects by giving its statement of technical feasibility to RPA lead and RPA architect, as well as granting and maintaining system access rights needed for the bot. Finally, center of excellence is the main facilitator for RPA across the whole organisation. This means it controls the RPA software platform, allocates resources, maintains project pipeline visible company wide, maintains target operating model for RPA, responsible on spreading information on RPA and developing RPA training.

5.4.2 Development Phases

Ravenna had focused competence development mainly on RPA center of excellence. Having RPA lead from center of excellence taking part on each automation project this was also seen as excellent way to keep improving and maintaining constant quality. After each automation project RPA lead would have discussions with the business about their opinions about the project and compile lessons learned document.

Table 8. RPA development phases

Phases		**Sub-phases**
Competence Development	Learning	Courses
		Self learning
		Lessons learned
Opportunity Identification	Idea identification	Identify RPA opportunity
	Discovery	As-Is process walkthrough
		Technical feasibility and effort estimation
		Business case creation
Design	Detailed Process Study and Solution Documentation	Process Design Document (PDD) + Acceptance Criteria
		Solution Design Document (SDD)
		Infrastructure and system accesses
Develop	Build	Development
		Test Scenarios and Sample Data
		RPA scripts and related documentation
	Test	UAT Testing
	Quality Process	Code review
	Deploy	BOT IDs and system accesses (prodcution environment)
Run and Maintain	Production Handover and Stabilization	Cost allocation
		BOT Live (production environment)
		Stabilization
		Monitoring

Initial suggestions for opportunity identification were mostly coming from intranet RPA site that received suggestion across the company from an embedded RPA opportunity identification tool. This tool in Ravenna's intranet would already calculate suggestive FTE that would be displayed to the person filling the information. RPA center of excellence would then be in contact with the person depending on if the suggested process to be automated filled criteria's, such as two FTE's and process complexity questions. After discussing with RPA lead and receiving approval to continue it would be up to the business function to continue. Business function where the presently manually performed process is done will construct business case documentation, that when finished is send to center of excellence. This document among other things includes high level as-is process walkthrough already. Based on the business case RPA steering group will give their sign-off to the project and center of excellence will insert it to the project pipeline. Prioritisation inside the project pipeline can be influenced depending on how critical the task is seen inside the function where the process is done.

Next will be the design phase. Design will involve heavy involvement from RPA lead, that will construct scheduling for subject matter expert, RPA architect, RPA developer, and process owner who will now be heavily involved on the project. This is a crucial part of the process that requires transferring all the needed information about the nature of the manually done process to RPA architect. First very detailed step-by-step mapping is done of the as-is process, that will be included in the wider process design document and done by the subject matter expert. This process design document and the process walkthrough is then presented in couple of meeting to the RPA architect. RPA architect will then construct the solution design for the automation There is no sign-off or project gate in the design phase.

In the develop phase RPA architect and RPA developer will be in close cooperation. Subject matter expert is still also needed to provide test scenarios and sample data for the developer to use. RPA architect will work as a middleman between subject matter expert and the developer as the automation is being build. After the development is finished there will be user acceptance tests that will be repeated till the process owner is happy with the demoed automation. After user acceptance sign-off, RPA lead will start deploying the automation to the live environment together with IT and ask for the final sign-off from the functions RPA hub, or if no local RPA hub exists, center of excellence will give the final sign-off. From that onwards the automation will move under run and maintenance that is under center of excellence to manage. Center of excellence will handle ticketing from business in case any problems with the bot and report to business about any maintenance breaks due to IT infrastructure or RPA software updates.

5.4.3 Scaling RPA Inside Organisation as Capabilities Grow

Early on many of the involved companies used RPA as more of a tactical tool. As part of the process of scaling up RPA in the organisation needs to show its value as a strategic tool, while experience and knowledge grew after early limitations. Early on there was

often no clear plans yet on how to utilize and scale RPA across the company. Especially if the software tool and proof of concept were driven by one function, rather than the wider organisation.

There not being bigger plan across the function was especially visible with Ravenna that had multiple competing RPA installations and project teams. As the largest shared service RPA project hub started to have robust pipeline and more experience on automation projects, more effort was put into treating RPA with a discipline you would see for any other enterprise system. Success of this team also meant other competing teams and hubs started to replicate their processes. The now established center of excellence team embraced many of the processes and methodologies directly from this shared service team. Eventually this center of excellence team did replicate the target operating model and some of the identification tools, that would be deployed to other hubs across the organisation. In Ravenna's case business units were the main drivers pushing RPA forward. Center of excellence did not have members from IT department but was the main contact point for business hubs to IT and the relating RPA infrastructure issues or questions.

Ephesus RPA was the opposite to Ravenna and these long-term plans for scaling across the company were being built at the time of proof of concept. For Ephesus the smaller size of the organisation had fostered centrally driven RPA from the start. Finance function has more autonomy as it carries more internal capabilities, but in general IT manages RPA and holds resources for RPA projects. Ephesus started scaling RPA truly in 2019, when example Ravenna had been an early adopter of the now standard RPA tools as early as 2016. Ravenna also had IT driven internal tools dating decade earlier that were still being developed and under use. Ephesus was able to use learnings other companies had gone through and do benchmarking across Finland on similar sized companies on the best ways to go forward. Ephesus example built early on capability to do more modular developing by saving scripts and reusing them for other projects. This

can also partly be tool dependant as the RPA tool being used had this capability from the start. Something that Ravenna did not have when starting. This modularity on development had not been implemented yet in Antioch.

On Antioch there were fears that RPA was not fully utilized organisation wide and low-hanging fruits outside finance were not being recognized. This was due RPA being initially driven into Antioch by the needs of finance. Finance held the resources and personnel knowledgeable on the topic. Other functions relied on external help on everything outside RPA software platform and IT infrastructure that was managed and provided by IT. Decentralised model also meant there was no clear center of excellence that would push RPA across the organisation. Finance was the only function that had RPA strategy in the company.

5.5 Weaknesses Found for RPA

All companies involved had mature RPA capabilities – yet there are still clear differences on scale of RPA operations and how RPA have been implemented in the organisation. These implementation differences multifaceted from IT infrastructure to different operational models used. This section will give view of the challenge's companies studied have observed in their current state of using RPA and do not emphasis challenges seen early on when implementing RPA in the organisation, if it is not directly influencing the current state.

5.5.1 IT infrastructure and Access Rights Management

All companies studied were using on-premises solutions of RPA. IT functions involvement is especially visible when building the IT infrastructure for RPA and when expansion is needed. Ravenna because of its early organic growth of RPA had competing

solutions internally. Because of this there were two different instances of Blue Prism RPA software with two different licence agreements. IT resources handling RPA had also been outsourced. Unifying this under one umbrella delayed the creation of center of excellence and the planned new company wide RPA operating model for a year.

> *We had two different server instances where our RPA operations were running under different Blue Prism licenses. Bringing all this together was a year-long process (Ravenna, RPA Specialist.)*

After Ravenna had completed the transition to the new IT infrastructure, new capacity had been created, and unified the license with Blue Prism, it was able to lead much of the RPA operations from the center of excellence and functions as planned. There has since been some new capacity needed and making the needed changes has still needed considerable time from IT, when business felt they have communicated the predictions and need for new capacity well in advance. There was still room to improve seamless scalability as the bot count rises.

IT controls and relating access right management is something none of the companies did rise as a challenge to their internal RPA operation. While in some studied companies RPA is clearly more led outside of IT function there still seemed to be clear understanding that access rights would be approved and handled by IT. Where this did get more problematic was when business function was buying RPA solution run totally by an external service provider. In this kind of situation this service provider was running over one hundred bots. There had been a case where under internal checks it was noticed that multiple concept owners of SAP had separately provided access rights to handful of people from these service providers and created clear segregation of duties risk. Access right management had not followed the protocols and the right access right role creation as it would have under internal RPA automation creation.

5.5.2 Use of Internal and External Resources

All companies involved used at least some external resources and all had solution providers and consultants helping at the very least on the proof of concept phase and driving RPA into the organisation early on. There were significant differences on what kind of involvement solution providers had on the development and design phase of automation projects, as well as maintaining the existing bots two years after the proof of concept. All had the same goal of having enterprise-wide capability on RPA, that would have evolved far from the proof of concept at first often driven by one business function. All were continuing to develop existing internal capabilities by training and rethinking talent development, as well as hiring further internal resources for RPA. Emphasis was on training more internally than hiring more for RPA operations specifically.

> *Early on there was a strong push for us to use Blue Prism as the RPA software from consultants. We held our ground wanted to come into our own conclusion what would be the best solution for us. Unfortunately, especially in the Finnish market we [Finnish companies] tend to move as a herd towards the same IT solutions. These solutions are then sold as solution packages that include range of resources and tools (Ephesus, Senior IT Manager.)*

Ephesus had most clearly separated themselves from external help after initial launch. Their RPA software tool provider and the constantly updated best practices worked as guidelines, but no external resources were used at the moment for as-is process mapping, automation solution designs, opportunity identification or run and maintain. This had been a clear decision from the start to create internal knowhow and available resources. RPA solution provider had helped initially when RPA had been deployed to the organisation by conducting interviews and training sessions across the organisation. These interviews across the organisation were used to create heatmap on RPA opportunities. Ephesus had then continued using solution partners tool for the

opportunity identification. Organisation wide regular townhall meetings were used to keep interest and spread information about RPA in the company.

All the companies involved in this paper were using internal and external RPA developers. Ephesus had largest share of internal developers. Part of the reason for this could be related to the Kofax RPA software used. Training for this RPA software is shorter and cheaper than what is required for the solution providers certifications some of the other RPA software tools used by other companies, such as Blue Prism, Automation Anywhere, and UiPath. In Antioch's decentralised model finance function had three full-time developers for UiPath, but other functions would need to use external help on automation development. For Amorium while there is a clear center of excellence, as well as a clear drive since the proof of concept to build strong internal knowhow on creating automations – it was not seen crucial to hire or train more internal RPA developers. Because of this Amorium will rely on partners for the automation development phase for the foreseeable future.

5.5.3 Importance of Internal Resources on Automation Design Creation

Ravenna and Amorium were facing ongoing challenges on process mapping the as-is manual process and the solution design document. Manual process mapping and the resulting process design document was in most cases done internally after RPA solution providers or own internal training had been completed. Depending on the tool this could be couple of hours or part of a wider introductory training that could take day or two. In most cases this training would be for the subject matter expert, as in the person or line manager who is directly involved in the process being automated. After the training, this person should be able to prepare the process design document of the work currently done manually.

Solution design document captures process that has been translated from manual work to something understandable for the developer and the RPA software. Solution design document does not just translate manual process for the developer for the automation but is much wider explanatory paper for the to be automated flow that explains and considers the systems involved, access rights, process exceptions, scheduling, process triggers, monitoring, and data security. This Solution design document is usually built by RPA architect and it is crucial for the success of the project. It was seen important for the RPA solution design to use in-house knowhow as much as possible. Good RPA architect will not just directly translate the manual work for RPA, but streamlines it for automation, and at best is able to see the bigger picture by linking it to other processes. This needs good level of understanding of not just the process being automated but of the general systems being used and ways of working in that function and in the organisation. Depending on the RPA software the training was much more involved, costlier, and longer, as well as include tests from accredited trainers for solution design and architects' certifications.

Ravenna had problems with external partners RPA architects that had been involved since the proof of concept not always being available for the automation projects. This meant that new RPA architects being brought into new projects were less familiar with systems and ways of working in that function. This often led to longer development times and inconsistent quality on the automations. These problems reflected even more to functions where RPA was less used because of the lack of internal resources to create solution design and process design document. Hurting RPA's perception in these functions.

> *We had trouble keeping constant quality because our "external partner" could not always offer the same RPA architect for all projects in one function. A lot of learned information about our existing processes and technical understanding was always lost once an architect left the "external partner" (Ravenna, RPA Specialist.)*

These automation solution quality inconsistencies had been a major headache for Ravenna for couple of years and after internal investigations main culprit had been tracked to the automation process solution documentation build by RPA architects having too often inconsistencies in their quality. Ravenna had sought to fix this in the following contract with the external partner stipulating the need for particular number of assigned RPA architects for the organisation, as well as Ravenna training more internal resources for this purpose. This would include full-time RPA architects, and some employees that would go through RPA software solution providers one-month training to help with finance functions projects when needed. These new RPA architect resources would be managed by the RPA center of excellence that would assign them according to the prioritisation in the corporate wide project pipeline.

5.6 Impact of the Organisational Models

As a whole outside of Antioch all organisations involved in this study had moved towards federated model around the time they had started to scale up their RPA operations outside of the incubator function. Antioch, even with its large count of bots deployed has still not scaled outside the finance function, where RPA was originally deployed to.

Ephesus had moved towards federated model without a clear plan at first. Center of excellence located in IT had trained first people in finance with the help of solution provider. Finance had been selected for the first trainings as most automation operations had been identified there. These internal trainings were for the as-is process mapping and one year later hiring full-time RPA developer for finance function. Finance took control of project pipeline for finance function. Center of excellence still coordinates resources and manages project pipeline for other function than finance. Finance holds by far most of the existing bots. IT steering group acceptance is needed

for automation on the center of excellence project pipeline. Finance function had wanted to get away from this gate review by managing its project pipeline.

Ravenna had multiple hubs across the whole organisation. These hubs were competing against the same internal customers. When automation was inserted as part of finance functions strategy was there a change to start converging these hubs and bring stronger governance model by establishing a center of excellence for RPA. Some hubs were using a lot of external resources, and the worry was that these separate hubs did not have the resources or capability to monitor efficiently the situation. Neither did they have the

Table 9. Summary of the case organisations

	Antioch	**Ravenna**	**Ephesus**	**Amorium**
RPA model early on	Decentalised	Decentalised	Centralised	Federated
RPA model now	Decentalised	Federated	Federated	Federated
Center of excellence	No center of excellence	Strong center of excellence	Weak center of excellence	Strong center of excellence
Bots deployed	100	800	100	150
RPA starting function	Finance	Finance	IT	IT

visibility to other hubs that were using resources from the same external solution provider. One of the firsts tasks for the new center of excellence was to establish new governance model and target operational model that would be implemented across the hubs. At the time of establishing the center of excellence it was found that from the external solution providers there had been too relaxed policy on access right

management. On this federated model all of the critical internal resources already existed. So early on most of the effort was put into unifying the processes and models, but also gathering information to the management about the whole organisations RPA situation and project pipeline. After one year on focusing this the center of excellence acquired its own developer resources and started expanding to business functions where RPA had not been used previously.

6 DISCUSSION & CONCLUSIONS

Findings resulting from the interviews of the companies taking part of the study will be discussed and final conclusions presented in this chapter, alongside the managerial implications. Discussion part will evaluate the findings from this study in light of wider literature corresponding to research questions posed at the start of the study. Lastly the lessons learned and implications for management are presented.

6.1 Discussion

First question of this study examines the different approaches organisations have taken to build their internal capabilities for RPA, and how are these capabilities structured to ensure functional project pipeline in a cross-organisational use of RPA.

> *What kind of steps have been taken to build internal RPA capabilities and how are these capabilities structured to ensure functional project pipeline?*

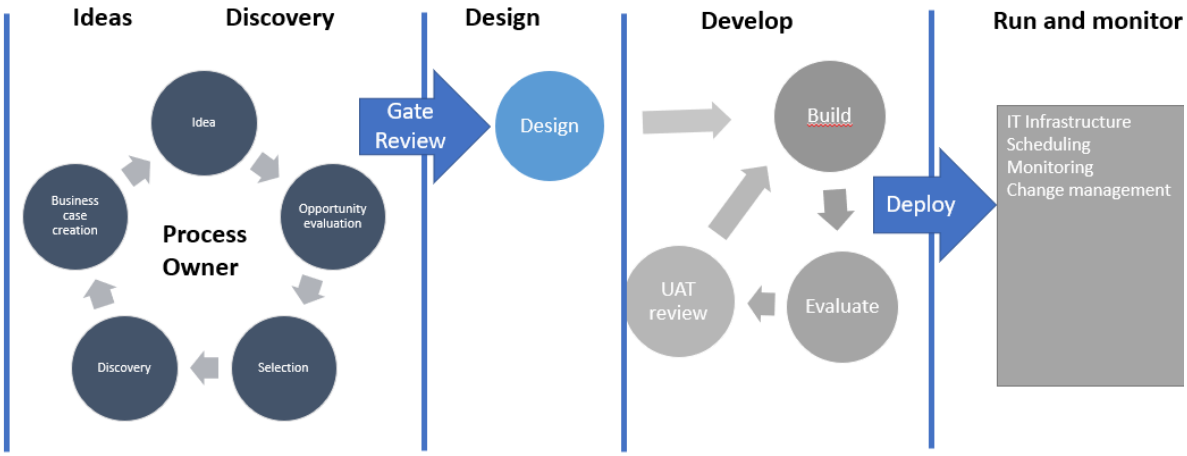
All the organisations involved in this study had implemented center of excellence for RPA, outside of Antioch. What was emphasised was the need of creating solid resource pool of internal talent for RPA and not solely rely on external partner. This did not mean internal resources were seen crucial on every role needed on the RPA development phase. Use of internal resources was seen especially important in the design phase, where the as-is process flow is mapped and the solution design for automation is build. This was perceived critical to maintain consistent quality on automations. Design phase was seen as crucial part of the process, that needs deep understanding of the causal relationships and good knowledge on the existing processes. To achieve this, building long term internal resources was seen as strongly preferred.

Building internal capabilities for the software development was something all organisations involved had done. For the number of automations done the internal developer count was fairly low. RPA hubs or center of excellence were happy to acquire external sources from existing external partners when internal resources were not enough. This once again highlights the importance of well-crafted solution design document that also makes RPA software developers path easier and less time-consuming part of the new automation creation.

Main differences in the organisational structure of capabilities come from the center of excellence and business hub's role in the wider RPA operating model. Strong center of excellence will maintain and work as the gatekeeper for organisation wide project pipeline. In a weaker center of excellence hubs will maintain project pipeline without center of excellence's interference. In this weaker center of excellence model the emphasis is more on coordinating and working as the RPA software platform holder and information sharing hub for the whole organisation. Design and develop resources would be held by the RPA hubs.

> *How does the RPA center of excellence need to evolve when RPA is implemented as* cross-organisational tool?

Figure 10. RPA target operating model



Second question of this study asks how RPA center of excellence has evolved and what kind of center of excellence operating models can we find in organisations that have scaled their RPA operations into cross-organisational RPA structure. All organisations apart one involved in the study had starter building federated model from the start or had shifted towards it. Exception was Antioch that had no organisation wide strategy on deploying RPA. RPA center of excellence capability stages and operating model are presented in table 4 and figure 10. RPA center of excellence capabilities are in three stages. Starting from possibly still siloed RPA capabilities in one business function. What does already exist are robust RPA methodologies. In the final stage RPA is part of the corporate strategy and there is an alignment across the organisation. Center of excellence should not concentrate on finding projects to automate at this stage. Rather, organisation should already possess well defined and maintained project pipeline, that is able to delegate to flexible resource pool, as well as respond to well described and scored ideas being send across the organisation. There is high trust on RPA center of excellence being able to respond to the needs and deliver consistent quality.

What roles are being established in a cross-functional setting in a mature RPA organisation?

Roles established for cross-functional RPA setting were introduced in table 7. Using Ravenna as an example. Willcocks (et al. 2015: 179) had found in his case studies for center of excellence alone not to be enough in a cross-organisational setting, rather there should also be a singular person to champion RPA. Evangelist of sort, that would push the message of RPA to C-level and across the organisation. Companies involved in the study did not agree that RPA needing to be tied to singular person as important. Ravenna, Ephesus, and Amorium did see center of excellences involvement in marketing RPA internally as one voice among its key functions and main benefits.

IT was not directly leading any of the center of excellences or RPA in general. It was emphasised that RPA needed to be business owned as a Lightweight IT software tool. IT involvement was restricted on the RPA IT infrastructure and access rights management. Ephesus was the only one that has IT governance steering group gate for the bot acceptance. IT involvement on individual automation projects comes automatically from the RPA solution design document. This document includes access rights and systems evaluation done by IT. These had not just been marked as clear yes or no gates on operating models.

6.2 Conclusions

RPA is not a new software tool anymore for enterprises and these enterprises are now expecting to see results as they scale up the operations beyond the function where RPA was initially deployed to see the full benefits of the RPA software. This scaling up across the organisation brings its own challenges as center of excellences are being established as new resources, and new roles that come with this. Center of excellence needs to find its place and purpose among various existing RPA hubs.

This study set to examine how organisations are managing this scale up of RPA. This was approached from the angle of what organisational models' companies are building to best succeed, as well how organisations are balancing between external and internal resources when expanding. Explanatory case study was conducted with four Finland based companies to better understand this.

Based on the data collected from interviews and literature review we can conclude that organisations are seeking to build federated model when they build true cross-organisational model for RPA and expand this lightweight IT software tool for wider use. In this federated model the center of excellence can either be strong or weak. Weak

when business hubs control the project pipeline and strong when center of excellence manages it. On RPA capability growth companies are seeking to increase their internal capabilities mainly by training existing workforce and focusing on handling design and discovery phases of RPA internally. Initially RPA software developer roles were seen more critical, but on mature RPA stages the focus has been on improving design phases' internal capability.

Concentrating visibility to the organisation wide project pipeline and communication to IT brings direct cost savings already in the early diffusion of concepts center of excellence phase by unifying the RPA software platform licenses and better optimisation by central scheduling of robots. On a robust project pipeline center of excellence also brings predictability to IT infrastructure needs longer term. Center of excellence located project leads are able to bring their expertise to every project, as well as more truthful timetable for individual projects, and such for the whole project pipeline.

This study's sampling size is small and can be considered region specific. At the same time its results align with the small amount of existing research that mainly focuses on the early RPA implementation on organisations and early RPA adopter stories. There are a lot of future research topics that could be expanded from this study and its organisational structure angle on RPA. These could be how emerging and already used cognitive automation tools are affecting RPA knowledge building in RPA organisations? What are the wider implications of lightweight IT software tools such as RPA, AI, machine learning and more, that use specialised workforce being implemented and managed by business units?

6.3 Managerial Implications

This study cannot present conclusively one organisational model that would fit any RPA organisation at all RPA maturity stages. What should matter is that the initial deployment to federated, decentralised, or centralised environment is done by respecting the size, structure, and prevailing culture of the organisation.

The implication of this study is that center of excellence is crucial at the latest when RPA scales to cross-organisational. Center of excellences role as the coordinator between IT department and business units is seen as an important role. This does not only bring direct cost savings due to better management of RPA software platform license costs, but also the foresight for IT infrastructure when one central location has visibility to the cross-organisational project pipeline. Federated model was seen beneficial as the RPA operational resources could be build more locally where they are needed and distributed to people who are familiar with the functions processes. This can also foster excitement when the business function natives are training and are directly involved on the automation projects. In the federated model local automation discovery and support inside functions in long-term can keep healthier project pipeline compared to centralised model. Federated model still needs strong synchronisation and acquiring the right people to manage and operate the center of excellence.

Messaging behind RPA should be consistent and visible widely from the start. This is needed to alleviate fears and misconceptions many people will have when they hear about RPA for the first time. RPA solution providers and literature all have similar phrases for the early messaging, but it is important to ensure this is done from the start and not after RPA has been launched. After deployment, or at the latest when scale up happens, there should be either RPA lead or center of excellence that controls the training and messaging across the company. Leaving this to functional hubs only can

create governance problems in a cross-organisational unified RPA platform situation, as well as knowledge gap and inconsistent messaging.

Internal RPA capability building should focus on training for employees to be able to build as-is process mapping and solution design. As-is process mapping training internally for subject matter experts is relatively easy to do on short training when needed. RPA architect, who would be responsible on solution design needs much more involved training process, and potentially expensive. This is still seen beneficial to ensure consistent quality, keeping projects under schedule, and better hold on governance. Internal RPA developers positioned in functional hubs or center of excellence are a great asset to ensure flexibility and knowledge inside hubs. Still, in this study automation design phase and the involved roles were seen crucially important to keep internal for the success of the whole project and for the long-term viability of RPA inside the organisation.

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APPENDICES

Appendix 1. Interview Schedule

Date	Company	Title of the Interviewee	Duration
16.11.2020	Amorium	IT Lead Architect & RPA lead	82 minutes
16.10.2020	Antioch	RPA Governance Manager & Head of Finance Development	58 minutes
15.06.2020	Ravenna	RPA Specialist	150 minutes
01.10.2020	Ephesus	Senior IT Manager & RPA Lead	110 minutes

Appendix 2. Interview Template

Basic information about the interviewee

Name

Title and role in the organisation and with RPA

Automation tools and technical implementation

Is there a primary RPA tool in the organisation?

Is the RPA tool deployed on-premises or cloud?

What were the primary criteria's for this RPA tool being selected?

Early implementation

What were the main challenges going from a proof of concept to a functional automation project pipeline?

RPA operational model and organisation model

Would you define the RPA organisational model as federated, centralised or decentralised?

Unit that is primarily responsible for governing the RPA capabilities?

- For discovery
- For design and development
- For operating and maintaining
- For tools, training and instructions

How does the RPA operational model look like?

What were the early challenges on building the operating model?

Were there RPA projects started by individuals before any kind organisation model was being implanted?

How is IT's role defined in the RPA context?

Who controls the RPA project pipeline prioritisation?

How has the RPA organisation evolved since it was established?

Has it been challenging to find RPA talent?

What are the current challenges you are facing with RPA?

Reception of RPA in the organisation

Is RPA part of the company's wider strategy or part of certain corporate functions strategy?

Was there a push from the C-suite for RPA?

How has RPA been received in the organisation?

Closing questions

Is there internally a clear set of KPIs for RPA project and how would success be defined for an RPA project?

What would be the main learnings from implementing RPA so far in the organisation?

How is RPA's role seen in the company going forward?