COPENHAGEN BUSINESS SCHOOL

MASTER THESIS

Designing a decision-making framework for assessing Robot Process Automation potential

Navigating towards a structured backlog

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Abstract

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Robotic Process Automation (RPA) has promised significant opportunities for organisations, which has led to a large backlog of opportunities. However, limited attention has been given to studies regarding project selection in relation to RPA. This thesis investigates how organisations prioritise their Robotic Process Automation project backlog to maximise the value of the technology. Drawing from the three concepts of automation, IT governance and decision structure, we have analysed case organisations in order to understand the current landscape. Through a Design Science approach we have outlined a computerised analytical hierarchical system capable of structuring large backlogs. We have identified fourteen parameters suited to prioritise RPA projects in a quantified framework. The parameters have all been weighted based on the average score discovered interviewing multiple respondents across public and private organisations. We discussed to which degree such a framework could be generalised across multiple industries. We found that specifically the roles and organisational maturity will have an impact when adopting the framework.

Keywords: robotic process automation, analytical hierarchy process, design science research, artefact, automation criteria

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Contents

List of Tables

List of Figures

Chapter 1

Introduction

1.1 Motivation

We have reached a point in time where automation is no longer a pioneering technological concept, but it is something that we are used to living by. In other words, we have reached a point where automation is a way of life for successful organisations.

The computer was invented to automate specific manual processes, and the development quickly gained momentum during the war. Following the invention of the computer, large organisations and governmental institutions adopted it to automate a range of different task. Subsequently, the computer entered almost every household in the world.

Computer Scientists are continuously building software to enhance the automation possibility of the computer further. In our modern days, we have automated tax returns, car registration, newspaper-dispatch and many other things.

While the concept of automating trivial tasks can hardly constitute a pioneering technological breakthrough anymore, Robotic Process Automation (RPA) is very different from the previous automation technologies that were developed and used by Computer Scientists. This time, we have democratised automation (M. Lacity et al., 2015).

RPA can automate tedious tasks that have predictable and repeatable interactions with IT applications. All employees can offer their insights and build small-scale prototypes, as the software for automation is readily available to download for free and the automation can be completed without writing a single line of code. (Lowes et al., 2015)

However, by democratising automation, organisations will suddenly experience several issues. One of the challenges is to correctly identify the best business case

for automation so that energy is not wasted pursuing a business case that did not fit the technology. Subsequently, RPA can be used across an unlimited range of software systems and therefore, quickly builds up a long list of possible projects. Selecting the wrong projects will lead to a rather limited competitive advantage (Asatiani & Penttinen, 2016).

This thesis seeks to assess the requirements for Robotic Process Automation to understand further how an automation business case should be selected to maximise the potential for the organisation. Subsequently, we investigate the challenges that different types of organisations are experiencing when implementing a process prioritisation system.

In line with the particular academic identity and theoretical field of the study line Business Administration and Information Systems, we seek to understand the relationship between the organisation, technology as well as the needs of the business. A relationship we have gained knowledge about through several relevant courses such as Artificial Intelligence and Robotics, Robot Armada, IT Strategy and Organisation Theory. These courses have been a part of our bachelor and master programs over the past five years.

1.2 Research Question

To guide this thesis, we rely on one overall research question and three subquestions listed below. The questions are interrelated, and information derived from each of the research questions provides feedback into the others.

How can organisations structure their backlog of Robotic Process Automation projects for prioritisation?

- What parameters can be used to assess the automatability of a given process?
- How can a prototype be outlined to assess the requirements for Robotic Process Automation?
- What are the challenges organisations are facing implementing a process prioritisation system across different types of organisations?

To examine and answer these research questions, we have adopted three different analytical concepts, Automation, IT Governance and Decision Structure. Through these three concepts, we seek to understand the challenges and subsequently outline a new framework to solve several challenges. Finally, we seek

to understand the interplay of the new framework in different types of organisations.

By collecting and analysing data from the two different case organisations, LEO Pharma and Skatteforvaltningen as well as two RPA experts, we conducted an investigation of the current challenges. Subsequently, we have utilised the methodologies of Design Science Research to iteratively sketch and outline a decision support system while further investigating the solution.

Our results have extensive value for RPA practitioners and organisations, as we demonstrate the competitive advantages that can be gained through designing and implementing a decision support system specifically to the challenges in RPA. Furthermore, we have contributed to the current literature by uncovering the interplay between RPA and long-established theoretical perspectives.

1.3 Topic Delimitation

This study seeks to outline a prototype to assess the requirements for Robotic Process Automation through Design Science. The study does not aim to build a complete set of tools and systems for implementation, but rather to lay the foundation for further research into the implementation of the system. The prototype will be outlined, sketched as well as described. The visual images of the prototype in this paper are therefore created to create a coherent understanding of the system and is not an illustration of the actual system as we perceive it if finished in the future.

1.4 Thesis Structure

To assist the reader, this section will provide an overview of the structure of the thesis. It will contain a brief explanation of the content presented in each of the upcoming chapters.

Chapter 2 - Literature review and theoretical background: Contains a review of the existing literature of the concepts of automation, IT governance and decision structure. The purpose is to gain a foundation to design the best possible artefact later on.

Chapter 3 - Research Methodology: Describes the methodological choices made in the research. It includes a presentation of the research philosophy, approach, strategy, design, as well as a reflection on some challenges encountered during the research project.

Chapter 4 - Case Description: Includes a brief presentation of the case organisation to give the reader an understanding of their background and organisational structure. Additionally, the chapter includes an introduction to the key informants interviewed as part of the empirical research.

Chapter 5 - Case Analysis: Provides an analysis of the case organisation's current use of automation technology. Along with Chapter 2 it produces the initial foundation to design the prototype in the first iteration.

Chapter 6 - Artefact development: Presents the progress of designing the artifact through three iterations. The first iteration is based on the analysis from Chapter 5 and the existing literature from Chapter 2. The second iteration includes the inputs from two respondent at KPMG to further asses and weight the parameters constructed in the first iteration. The third iterations present the final prototype, where the parameters are weighted by all the informants interviewed in this thesis.

Chapter 7 - Discussion: Discusses the findings from previous chapters. It also discusses theoretical and practical implications. Finally, the chapter discusses some limitations of the study and provides suggestions for future research.

Chapter 8 - Conclusion: Contains a conclusion to the overall research question as well as the three sub-questions by summarising all major findings in the thesis.

Chapter 2

Literature review and theoretical background

2.1 Introduction

In this chapter, we will conduct a literature review of the relevant theoretical sources. The chapter has been divided up into three different sections, that each covers a 'concept'. A concept in this thesis is a combination of different theoretical areas are combined to form a mixed concept, as such this is three different lenses, in which we will evaluate the different parts of the thesis through, as seen on Fig 2.1.

The three concepts of literature will contribute to the combined development of the artefact. They will each be described in detail during the analysis in Chapter 6, to understand the challenges that organisations are currently facing in the prioritisation of RPA projects. Furthermore, we will also use the concepts to build the final process prioritisation system.

The reason for dividing the different theoretical sources into concepts is to cross-review different papers and sub-concepts against each other, such that challenges and weaknesses can be uncovered. Moreover, it gives us the ability to develop interview-questions that has been operationalised in each of the concepts. A weakness using a tool like this is that it is challenging to manage the connection between the different concepts. To ensure we have been doing that, the artefact will be developed with each of the three concepts in mind and will be the core mechanism to bind the concepts together.

First, we will describe the approach to finding and reviewing the literature. Following that, we will narrow the focus into the concept of Automation. During this section, we will describe Robotic Process Automation as well as look into

the processes that are most fit for this technology and the parameters for selecting such processes. Moreover, we will look at the implementation model for RPA projects.

Third, we will look into the concept of IT Governance. A vital foundation for that concept is the Information Technology Infrastructure Library (ITIL) that contains a comprehensive framework for IT services and best practices in IT. Furthermore, we will look into the realisation of benefits following the implementation of IT Projects. Subsequently, we will look into automation criteria.

Finally, we will look into the concept Decision Structure, that has been divided into two subconcepts. First, the organisational context regarding decision structures will be analysed, and differences in public and private organisations will be reviewed. The following subconcept is focused on frameworks, especially the Analytical Hierarchy Process (AHP) framework as well as Computerised Decision Support Systems (CDSS).

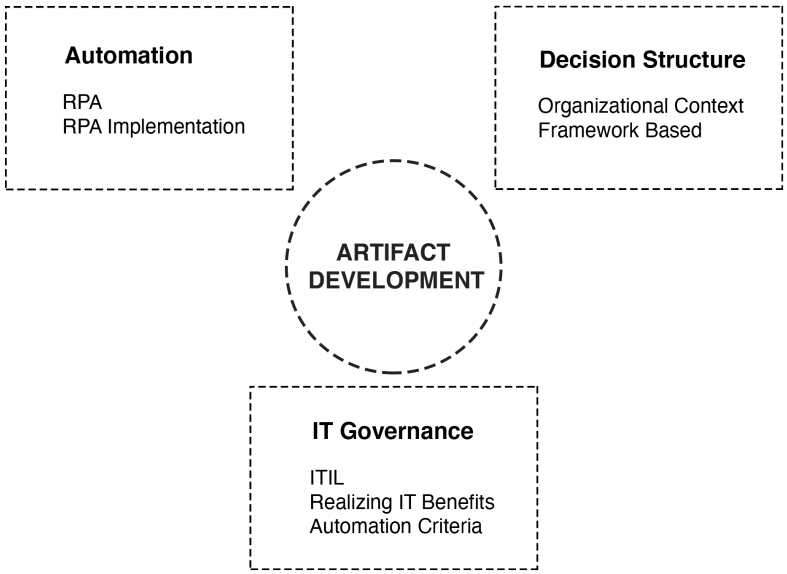


FIGURE 2.1: Theory concept development model

2.2 Review approach

Our literature review aims to identify relevant research and key findings through the different three concepts of literature. Our literature review relates to what Rowe (2014) characterises as the literature review for understanding. This review follows the recommendation of Rowe (2014) with systemising the screening and search process in the following order: 1) Selecting a research question, 2) Selecting bibliographic or article databases, websites and other sources, 3) Choosing terms for searching, 4) Applying practical screening criteria, 5) Applying methodological screening criteria, 6) Doing the review, 7) Synthesising the results (Rowe, 2014).

The research questions will be guiding the process of finding relevant articles to the literature review. In order to locate and choose the relevant articles, specific terms have been chosen in relation to the literature streams. The relevant literature has been discovered through literature databases that contain journals, articles, and books on the topics. The databases which were used for searching for articles were Jstor, Libsearch, Research gate, AIS e-library, Science Direct, and Tandfonline.

Relevant terms within the literature streams were chosen for article searching, which benefited with plenty of relevant articles. To identify relevant research among the articles, we read abstracts to decide whether the article fits our screening criteria. Furthermore, we also used backwards searches within the articles, which led to a backward snowball effect by scanning the reference list on relevant articles (Noy, 2008). By using several literature databases, this research ensures a broad perspective on the literature streams, with a high number of search criteria in each literature database. A screening of hundreds of articles chose the articles used in this paper. Significant criteria in the screening process were chosen only to include empirically based research, to secure that only well-supported literature was included.

To ensure a cross-understanding of the concepts, we researched the literature in collaboration at the beginning of the thesis process. Following that, we noted all relevant articles that would be able to cover the foundation that we needed to understand the problem area. Subsequently, following the guidelines by Rowe (2014), we divided the three concepts so that each group member could concentrate on the sole concept given to the respective person. Finally, we conducted

a review of each of the concepts to cross-validate the theories as well as understand the synergies between the concepts. During the empirical evidence gathering, further literature has been added following the full understanding of the thesis group.

2.3 Automation

In this section, the literature on automation processes and its evolution will be reviewed with a critical and reflective perspective.

The first part of this section will include a critical perspective of Robot Process Automation (RPA) and its use, as well as an explanation of why organisations saw this as an important part of their work and how technology has evolved. In the second part of this section, the implementation of RPA will be discussed with a perspective on organisations' use of these technologies.

For over 130 years, organisations have tried to systematically convert humans into robots by routinising and structuring work for the objective of organisational efficiency (M. C. Lacity & Willcocks, 2017).

2.3.1 Robotic Process Automation

There are many ways of automating processes, and over the past decade, newer technology has made software robots and mainly RPA a tool that many organisations choose to use. The term RPA is defined by IEEE (Institute of Electrical and Electronics Engineers) 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 to deliver a result or service with human exception management." (Moffitt et al., 2018).*

Robots are not a new phenomenon and have been around for many decades, but RPA is a technology that performs trivial and routine tasks across systems using the software. The innovative thing about these kind of robots is that organisations can easily procure them, and they do not have the same size as physical robots since they are installed on a computer. For this, the following software can be used; Blue Prism, Automation Anywhere, UiPath among others, to set up the robots. RPA is able to perform tasks 24 hours a day across many different

systems. The revolutionizing factor of RPA is the democratization of automation, that provides almost all employees with the basic capabilities of performing automation. (Willcocks et al., 2015).

Geyer-Klingeberg et al. (2018) states that with current RPA software, the user is able to automatically record their actions and the software generates a robot to perform the same actions as the user. This means that the virtual robots are integrated into existing software and complete the tasks across multiple systems. Their configuration is running using simple rules, and the process can be performed independently, meaning the robots can work all hours of the day. Thus, there are relevant cost savings that can be achieved, and RPA vendors pledge precision and quality assurance.

M. Lacity et al. (2015) agrees with Geyer-Klingeberg et al. (2018) and elaborates that RPA's guarantee of precision and its quality assurance help organisations reduce costs significantly because they are confident that the work is completed successfully. However, it is not just cost savings that organisations face when using RPA. A previous case study of the same M. C. Lacity and Willcocks (2017) found that a mobile communication provider deployed more than 160 robots that processed more than 400,000 transactions each month. This meant that they had a return on investment (ROI) of over 650% in 3 years.

Furthermore, they say that the jobs of the future will be a collaboration between robots and humans by achieving goals together. This is what Porter and Heppelmann (2014) agrees with, emphasising that the best result is achieved when robots and humans cooperate.

It is not just the benefits of RPA that the literature signifies. Because robots take over manual processes that humans have previously performed, it can cause uncertainty for employees that robots take over their jobs and make them unemployed. Asatiani and Penttinen (2016), cite this as one of the disadvantages of RPA, and they suggest that it is essential for organisations to be aware of it. Although M. Lacity et al. (2015), states that robots have no significance on job loss, Asatiani and Penttinen (2016), state that insecurity for employees can greatly lower the morale for employees and this can weaken the collaboration between management and employees and provide a negative output.

Furthermore, some scholars argues that for RPA to be succesful, the current processes should be highly documented. In order for the robot to do the job correctly, all steps in the ongoing process must be documented, as this can lead to errors in

the robot (Geyer-Klingeberg et al., 2018). Cewe et al. (2017) disagree with the importance of a high level of documentation quality of the current process, as RPA often aims to transform existing processes so that it simultaneously performs the tasks and improves the process. However, Cewe et al. (2017) acknowledge that the current documentation quality will be used to design the robots and its review of the process, but do not consider documentation quality as a crucial parameter.

2.3.2 Robotic Process Automation Implementation

Asatiani and Penttinen (2016) have in their article, created a model for implementing robots. In this model, there are four stages that the organisation has to go through before implementing the robot. All four phases are essential for a successful implementation. When the overall idea of RPA is simple, Asatiani and Penttinen (2016) devote much time to evaluation, analysis and planning.

The first phase is a workshop where the RPA potential is discussed and includes a review of the processes currently being performed by the organisation and identification of potential areas eligible for RPA. (Asatiani & Penttinen, 2016).

In the second phase, the processes and the underlying tasks must be assessed with the staff currently performing these tasks. The objective here is to break down and map the process into concrete rule-based steps. For this, the employees who perform the task must be observed and record the process flow that is performed, and subsequently note the necessary adjustments in the process to make it more 'robot friendly' (Asatiani & Penttinen, 2016).

In the third phase, a business case must be designed based on the information gathered. In this business case, we need to outline how the robot will automate the processes, and other automation can be combined with people, which will mean that the organisation can gain financial benefits and become more productive (Asatiani & Penttinen, 2016).

FIGURE 2.2: RPA Implementation model

The final phase includes the implementation of the robot. Here all the recorded steps must be carefully reviewed, and a guide is made on how the process is performed. At this stage, there must be experts who can follow a step-by-step guide to implement to robot (Asatiani & Penttinen, 2016).

2.4 IT Governance

Over the years, IT has become the backbone of businesses to the point where it would be impossible for many to function, let alone succeed, without it. As a result of its increasing role in the enterprise, the IT function is changing, morphing from a technology provider into a strategic partner.

IT governance is a concept that has suddenly emerged and become an important issue in the information technology field. Precisely when this new challenge began surfacing is unknown, but it is now a discussion issue within most organisations. Some corporations and government agencies began with the implementation of IT governance to achieve a fusion between business and IT and to obtain needed IT involvement of senior management. In surveys, CIOs also indicate IT governance as an important management priority (De Haes & Van Grembergen, 2004). While there are several existing definitions of IT governance, they are all similar in their basic understanding. Van Grembergen and De Haes (2005) defines IT governance as:

> *"the organisational capacity exercised by the Board, executive management and IT management to control the formulation and implementation of IT strategy and in this way ensure the fusion of business and IT."*(Van Grembergen & De Haes, 2005)

Every definition revolves around the fact that IT strategy and business strategy should always be interchangeable and never be isolated from one another.

This section of Chapter 2 will start at a broad perspective by reviewing the literature on one of the most well-known standards in IT Service Management; ITIL. We will then narrow the scope by looking at how organisations can gain value from their IT investments and achieve the desired benefits. Finally, the section

will look at the literature of criteria for the optimal process for automation. Each part will serve the purpose of generating a foundation for designing the best possible framework for prioritising automation projects in the private and public sector.

2.4.1 ITIL

To obtain a successful IT service management process, a popular tool being implemented is the Information Technology Infrastructure Library (ITIL). ITIL is a collection of comprehensive and consistent codes of best practice for IT service management, which has been widely adopted in the past twenty years (B. Andersen & Fagerhaug, 2001). To reduce costs and to improve management of IT service delivery, the Central Computer and Telecommunications Agency (CCTA) in the United Kingdom created the IT Infrastructure Library framework in the late 1980s as a reaction of a severe economic downturn (Sallé, 2004). It consists of more than forty books, referred to as the ITIL books, which contains these best practice guidelines for IT service management.
As a result, IT service management standards such as ITIL are now increasingly important to organisations all around the world. The standards and guidelines provided by the ITIL books attempt to satisfy the business needs of the organisation, making IT a strategic partner rather than just an asset (Cater-Steel, Toleman, & Tan, 2006). Aligning information technology with the business has become increasingly important in the 21st century, which has resulted in IT moving away from being merely a service provider and instead become a critical part of the organisation on a strategic level (Sallé, 2004).

According to Barton (2004), the framework is considered a supplement to different IT governance frameworks and has been heavily adopted in Europe, especially in the public sector. However, the way organisations adopt ITIL is very different. In recent years much debate among IT professionals has revolved around whether it is possible to implement a best practice framework. Some experts have stated that organisations should only adopt a best practice framework, not implement it. Other experts have stated that organisations can implement an improved or initial IT service management by using the knowledge base provided by the ITIL books as an enabler of the implementation (ITILnews, 2009).

Even though it seems like following a set of IT standards would only have positive effects, researchers have pointed out some organisational challenges when using ITIL. The discussion regarding implementation versus adoption above presents one of the challenges that researchers generally agree on; implementing the ITIL framework can be difficult since there is not a clearly defined method on how to implement the standards (Cater-Steel, Tan, & Toleman, 2006). A reason for this being that the generic model of ITIL is quite complex, which requires a high level of internal skills and knowledge among IT professionals. Several scholars have found that the lack of internal skills is one of the critical factors to an unsuccessful ITIL adoption (Iden & Langeland, 2010; Cater-Steel, Tan, & Toleman, 2006).

Another challenge that is commonly experienced is a lack of executive sponsorship. The cost for system development and customisation of tools, accompanied by the implementation of ITIL can be very high. Specifically, at the beginning of ITIL's lifetime, when the organisational culture was very conservative around information technology, intensive training of employees had to be carried out, and new personnel would have to be acquired. These costs would often be a factor that made it difficult to convince the higher management of the potential of following these new standards at the time (Hochstein et al., 2005; Iden & Langeland, 2010). Senior management does not necessarily need an in-depth understanding of ITIL but must provide support in terms of resources and authority to enforce new policies (Cater-Steel, Toleman, & Tan, 2006).

Furthermore, researchers have raised concerns about the way models like these can stifle the innovation level of the organisation. This mechanism typically shows itself in that the organisation buys into the standard processes prescribed by the model. The mechanism, to some extent, represent industry best practices, by adhering to the model, and often stop or at least reduce their efforts to suggest new and more innovative methods of conducting business (B. Andersen & Fagerhaug, 2001).

Not only is this a threat to the innovative level of the organisation, but it can also hinder the decision to implement needed change to a process implemented under the ITIL standards. These processes will gradually have generated a very high amount of documentation in terms of flow charts, work description, interface documents, templates etc. Even if someone reasons that revision of this documentation material is needed, it is easy to argue that it can be postponed,

since it involves too many resources. This highlights that following these standard models to their extreme extend, can make the organisation more static than they should be, not only when it comes to being innovative, but also in terms of smaller improvements to existing processes (B. Andersen & Fagerhaug, 2001).

Additionally, and perhaps most relevant for this thesis, some researchers highlights another disadvantage of using the ITIL framework. As mentioned earlier ITIL's generic model can be quite complex, and it does not provide any indications of which processes are more important than others or discern between critical and "nice-to-have" flows of services or information. As such, it might be difficult for inexperienced users to decide which parts to focus on, especially since it is rarely feasible to include every aspect of the model (Cater-Steel, Tan, & Toleman, 2006).

Others to the contrary, argues that it represents a business process library that can help organisations in the early part of a process orientation project to identify which processes it should put in place. Since the framework provides some widely acknowledge best practices, it should help organisations, prioritising their projects, at a low amount of workload (B. Andersen & Fagerhaug, 2001). The conflicting views on this factor make it even more interesting to look deeper into this area.

In regards to these challenges, some of the literature has raised the question of whether predefined models are needed in an organisational context. However, most of them have come to the conclusion that the benefits of a set of predefined standards outweigh the challenges. Especially if the initial strategy is to look for some quick wins, which is a typical scenario for many organisations (Cater-Steel, Toleman, & Tan, 2006; B. Andersen & Fagerhaug, 2001).

A specific concept defined as a part of the change control process within ITIL is a change-advisory board (CAB), which is not only used in IT but also outside the IT world as a part of the change process. When a change is being implemented, an analysis of the incident, problem and the importance to the organisation is conducted to prioritise the changes. In a resource-constrained environment, CAB is commonly used to prioritise the demand among units internally. In a less centralised scenario CAB can also be adapted to only intervene when the prioritisation is not agreed on (Soomro & Bashir, 2012). Both scenarios are relevant for this study and will be used when designing the artefact during Chapter 6.

Scholars argue that a key path to a successful implementation of change is the CAB review meetings, where the board decided whether to go for a change or not. The CAB consists of representatives from all the interested parties, both in IT and the business. In these meetings, strict procedures such as meeting minutes and communications rules should be followed. The CAB should review all proposed changes and decide the number of resources and funds allocated. Additionally, an essential responsibility for the CAB is to review already implemented changes to assess, whether they were implemented correctly (Soomro & Bashir, 2012).

2.4.2 Realising IT benefits

After reviewing some of the literature on one of the most well known best practice frameworks in information service management, this part will narrow the scope even further and look at how organisations can realise the benefits on information technology in the most optimal way. When making investments in IT, most organisations focus on succeeding in their implementation rather than realising the expected business benefits. Evaluating the value of an IT investment can often be challenging due to the complex nature of IT and differences in the interpretation of value (Melville et al., 2004; Barclay, 2008).

Despite the challenges of defining IT value, several principles for evaluating IT benefits are widely agreed in the literature. For example, value measurements should cover multiple organisational levels and utilise, both qualitative and quantitative measures (Davern & Wilkin, 2010). Also, identifying the stakeholder perspectives, clarifying evaluation objectives and constraints, and recognised IT focus and use (Marthandan & Tang, 2010).

Another generally agreed principle is that having technology on its own does not confer any benefits or generate value. Unlike many other assets, such as machines and real estate, the value of technology is not found solely in the possession. The value of IT is not obtained until the acquired technology is used in alignment with the business strategy to reach a measurable objective. Only business managers and users can realise business benefits. The benefits emerge when individuals or groups in the organisation can perform their daily work more efficiently. Additionally, benefits emerge when technology enables and shape new and innovative ways of working in the organisation and improve its interactions with customers and suppliers (Peppard et al., 2007).

In their research Peppard et al. (2007) identifies two distinct types of IT; problem-based- and innovation-based implementation. Both types are similar in the way that they can be presented in any kind of IT project no matter the size, but the impact on employees and stakeholders are different and should be handled accordingly. It is important to identify which type of project you are working on early in the process.

The problem-based or 'ends driven' implementations focuses on the end result – the organisation is primarily investing in IT to improve performance in order to achieve one or more of the following:

- Overcome an existing disadvantage against competitors
- Prevent performance deteriorating in the future to a level that would be a disadvantage
- Achieve stated business targets
- Remove constraints that are preventing opportunities being taken.

Examples of problem-based interventions include: integrating customer data to provide a single point of contact for customer enquiries; implementing an ERP system to remove reconciliation problems between production and finance; providing employee self-service applications via a portal to reduce administration and purchasing costs; and providing laptops to the mobile sales force to ensure the accuracy of customer quotations (Peppard et al., 2007).

In the innovation-based, or 'ways and means' driven type, the IT investments are used to exploit new business opportunities or break down barriers to new markets by:

- Doing something new involving using IT
- Doing something in a new way using IT
- Using new IT to do something it could not do before.

In all these situations, the innovation is dependent on a combination of the technology, the organisation's technical expertise and the ability of the organisation to change in order to make the optimal use of the capabilities. Examples include: creating an online sales channel to reach new customers; introducing vendor managed inventory for key suppliers; allowing customers to undertake self-billing; deploying a data warehouse and analytics to automate operational

decision making, and introducing mobile technologies for professionals to work on-line during client engagements (Peppard et al., 2007).

Based on the theoretical foundation of the research by Peppard et al. (2007), K. N. Andersen (2018) has created a framework more specifically focusing on realising IT benefits from the use of robotics. Robots in business: innovation and problem solutions (ROBIS) is a framework that pushes managers to approach robots as a source for helping to solve existing problems in the company, but also as an innovation driver (K. N. Andersen, 2018).

Both types of IT projects mentioned above are significant when studying automation technologies and RPA in particular. It is definitely a factor that should be considered in the initial stage when prioritising automation projects in the project portfolio.

2.4.3 Automation criteria

After reviewing how organisations should actively attempt to gain benefits from their IT investments, the scope will be narrowed even further to the core of this thesis, namely automation technologies. In this part of the chapter, a review of the existing literature on automation criteria will be presented. As mentioned earlier in the chapter, multiple criteria make a process suitable for automation with RPA. A general saying is that robots that are performing robotic process automation are designed to handle repetitive tasks, suggesting that not all kind of processes are suitable for automation with RPA (Sibalija et al., 2019; Fung, 2014).

To assess whether a process is appropriate for automation with RPA, following Fig 2.3, the organisation must assess whether the task is routine or non-routine. In addition, the organisation must evaluate whether it requires the use of manual or cognitive affordances. Processes that have large cognitive tasks require creativity and the processes are often to complicated to automate through RPA because it needs to use recognisable patterns as well as manual and repetitive processes. If the process is non-routine, new thinking is needed to solve the task. If a process is very routine with repetitive tasks that do not require cognitive thinking, then the potential is high for RPA. Figure 2.3 visualises the automation potential.

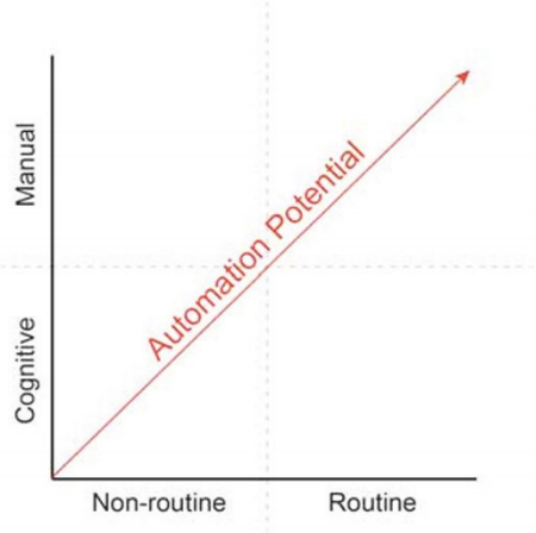


FIGURE 2.3: Automation Potential

Asatiani and Penttinen (2016) set up a rule of thumbs that states

> *"The rule of thumb for task suitability for automation is to determine whether one can accurately write down all the steps of the process, taking into account all possible events and outcomes along the way. While the advancements in Artificial Intelligence enabled automation of some non-routine tasks, the general principle remains the same." - (Asatiani & Penttinen, 2016)*

To determine whether an assignment is RPA-compliant, there are many factors to consider. Fung (2014) and Slaby (2012) have set several criteria that must be met for a software robot to replace a human task. The first is that there must be a high volume of tasks to be performed. The task must involve several systems, which can be where data has to be copied from one system to another. A stable environment is essential so that each time the task is performed, the IT systems remain intact. The tasks must contain low cognitive requirements, which means that the tasks do not require creativity, subjective assessments or complex interpretative skills. Furthermore, the tasks should be easy to break down into simple, straightforward and rule-based steps that cannot be misinterpreted. The tasks must be prone to human error, and then the task must be highly standardised.

Eventually, Fung (2014) and Slaby (2012) states that the task must be measurable, and the company must understand the current cost structure of the task.

Beyond the manual and routine nature of the task, the company must also consider whether it is viable to replace people with software robots for specific tasks. Eventually, the long-term consequences of such decisions must be examined.

The above parameters are key inputs to what will be the foundation of the initial artefact design in Chapter 6.

2.5 Decision Structure

During this chapter of the literature review, we will momentarily zoom out from the IT Governance models and instead look at a broader overview of decision structures. By analysing the organisational context of our cases, we are able to recommend certain formal structures, frameworks for decision rights and similar concepts for decision making.
Moreover, we will look into the framework based decision structures, which are looking at decision rights in connection to decisions as well as frameworks for decision making. We have named the combination of these two subjects 'Decision Structure' and will refer to it as such.

Decision Structure is the structuring process that is more or less defined in an organisation regarding decision making. The structures are what gives the context for a decision in terms of the goal that the empowered decision-maker have in mind, as well as the frameworks and constraints that the decision making is bound upon.
Decision making is not constrained to taking a decision among a subset of opportunities, but also the idea-finding of different possible opportunities that can be decided upon, as well as the implementation of the decided opportunity (Dillon et al., 2010; Mintzberg, 1990).

Decision making is either very simple or very complex. The more complex a decision is for the organisation, the more strategic it becomes. This thesis primarily seek to be in the field of *rigorous* decisions that do have a strategic implication on the organisation. Fig 2.4 shows the decision hierarchy as well as describes the time needed for each decision level (Howard, 2007).

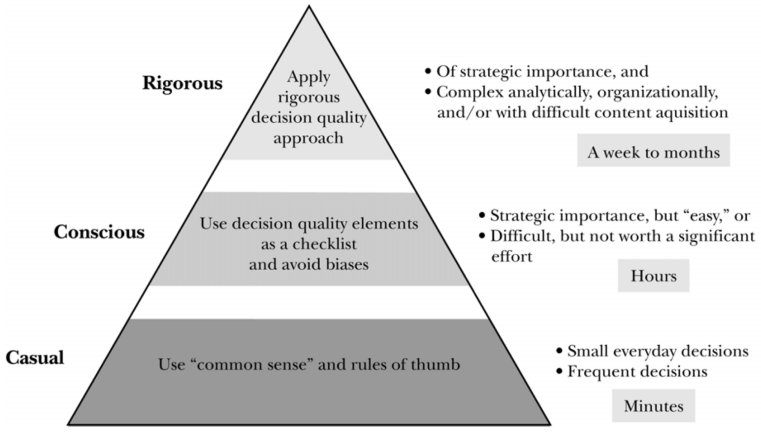


FIGURE 2.4: Decision Hierarchy

2.5.1 Organisational context in Decision Structure

Definition of Organisation Context and generic business models

Decisions taken by companies are often related to the informal and hidden structures in the companies. Scholars in this subject refer to these external influences as 'organisational context' (White, 1986). Organisational context is not only a choice of where and how to compete in the market, but instead scholars discuss the organisational context, and its influence on decision making and organisational performance. Several generic business models have looked at how to optimise the organisation for certain markets and competitor situations (White, 1986; Allen & Helms, 2006; Hambrick, 1983).

The adaptation of generic business models as well as strategic decision making have had interesting and varying results across sectors, but have generally been viewed as successful and are essential to enable, implement and understand the organisational differences, that often differentiates successful organisations from less successful in terms of decision making. Successful organisations make decisions faster than their peers, they make better decisions and finally, they implement more of their decisions into the organisation. Generic business models have been successful in making organisations adapt and achieve these criteria (Dillon et al., 2010; Allen & Helms, 2006).

Although the generic business models have had widespread success in the private sector, supporting growth and decision making, these models have rarely been adopted in the public sector, as these models are focused on competition in the market, instead of collaboration between public sectors.

In the cases that have been seen from the public sector, generic business models have been less successful than in private companies, but have shown improvement in those cases where the generic models have been changed to adapt to the sector. Adaptations range from focusing only on a subset of the generic model while other adaptations are rewriting the competitor-situations to being collaboration-situations (Bryson & Roering, 1987).

In relation to the topic of this thesis, RPA, current literature have not discussed the implementation of RPA in terms of efficiency in private versus public.

Furthermore, scholars have looked at the context of being a private or public organisation in terms of their strategic decision process. These two sectors differ in

their perception of how to do decision-making (Kingsley & Reed, 1991). Moreover, there is a lack of strategic decision making towards a purpose for public sectors. The Kingsley and Reed (1991) analysis, therefore, aligns with the misalignment between the generic models and the public sector.

> *"In the private sector sample, there is general agreement between top- and mid-level managers on the identification of the strategic decisions facing the organisation. This commonality of purpose is far weaker in the public sector sample." (Kingsley & Reed, 1991)*

Although the findings from the study by Kingsley and Reed (1991) are solid when looking at his paper, the differences between the public and private sectors are less substantial than perceived, when analysing the outcomes of his interviews with relevant stakeholders. A range of other studies have found the same differences but less significant (Kingsley & Reed, 1991; Nutt, 2006; Dillon et al., 2010).
Moreover, the private companies have given more authority to the top- and mid-level managers and these, therefore, feel less empowered for strategic decision making. Therefore the use of framework based decision structures in the public sector might be challenged, which might affect the informants view on our proposed artifact in Chapter 6 (White, 1986; Kingsley & Reed, 1991).

Decision making in private vs public

As it will be shown, in Chapter 4 when introducing the case organisations, knowledge about the difference in decision making between the private and public sector might become valuable.

Scholars have looked at public and private decision-making differences in comparison with the factors that differentiate successful organisations from less successful, and they find that while private organisations do take better decisions as they are often more aligned to their overall vision, they are instead slower to implement the decisions into the organisation and they implement less of them than their public peers (Kingsley & Reed, 1991; Nutt, 2006; Dillon et al., 2010).

Moreover, the public sector differs in decision making, by bargaining with both the government and their peers, while the private companies are instead relying more on analysis and less on bargaining with each other. Therefore the public sector might gain a false perception of support for their decisions, while the private companies might have issues in gaining enough support and understanding

for their decision, and therefore have to defend their analysis, because of a lack of human understanding (Nutt, 2006).

The discussed studies have looked at the differences between public and private organisations, but have left out hybrid organisations, which in a Danish context, would be organisations like Danske Statsbaner (DSB) or Danmarks Radio (DR), which are owned by the state but run as private enterprises. How hybrid organisations react to the discussed decision making contexts, are not relevant for this thesis, as the proposed framework, should span from the public to private and therefore also include hybrid organisation by that definition (Lan & Rainey, 1992).

Centralisation versus Decentralisation

Centralisation and decentralisation in the organisation are defined as the level at which the decisions are being taken. By adopting a higher degree of centralisation, you will be able to have a higher degree of central information usage as you will have to work towards spreading this information in a decentralised organisation. Furthermore, centralised organisations need fewer control systems, as they do not need to control and monitor leaders below them (Brickley et al., 2015).

The benefits of decentralisation is a more effective use of local knowledge, that can be used to find the right opportunities for decision making in automation. Moreover, the decentralised organisation also tend to spend less time on 'micromanaging' their middle managers, as they have been empowered to take decisions on behalf of the company (Procter et al., 1999; Brickley et al., 2015).

To contradict the work of Brickley et al. (2015), several other definitions of centralisation and decentralisation have been used by scholars. Some argue that an organisation might be built as decentralised, with a lot of different layers, such as only a few employees that refer to the same managers. In this scenario, the top management is still able to force down decisions on middle managers.

Therefore decentralisation is rather a concept on how the power is concentrated in the organisation and to which degree managers and workers are empowered to participate in the decision making progress. It is not important that a person is a manager, but what is instead important is the given employee-empowerment

and the participation, for an organisation to be decentralised (Carter & Cullen, 1984; Procter et al., 1999).

An argument for an extreme degree of decentralisation can furthermore be made, by the reduced costs associated with motivating workers to work on ideas that might be against their own opinions. In the context of IT decisions, there will often be several ways to arrive at the same answer, but by giving the worker full control of the task, he will be self-motivated and less likely to shirk, make mistakes and will not need to be granted any incentives, but is merely driven by his motivation to prove him and his solution.
Therefore, he should be given a larger say in the decision making progress, as to motivate him, even if the manager is more knowledgeable than the worker (Zabojnik, 2002).

However, it is important to note, that although the government uses the same rhetoric as the previously discussed notions, they do have political control problems, as the government is responsible to the entire population, and not to a group of shareholders. The organisational impact on the public and hybrid organisations are, therefore, of key importance, when proposing technological frameworks for decision making.

Scholars do generally agree, that public institutions should focus on transparency and decentralised organisational models, to ensure that the population can take control of certain parts of the government and to ensure accountability, visibility and transparency (Tommasi & Weinschelbaum, 2007; Seabright, 1996).

On the subject of decision management and centralisation versus decentralisation, it must be noted that the reason for discussing these organisation characteristics in the same notion as we discuss decision making, is that in the decision process, a team is often involved, resembling a small organisation that internally arrange power and responsibilities to each other.

One argument for decentralisation is that different team members will have imperfect information about the other members' knowledge. The imperfect information have to be converted into tactile information that can be acted upon. If a decision process is run by a single actor without any outside input, the degree of imperfect information will have a potentially devastating consequence in the implementation phase of the decision (Zannetos, 1965).

Moreover, we will also need to keep in mind the shirking and the lack of motivation, if the workers that will ultimately implement the decision is not taken into consideration (Zabojnik, 2002). This factor is mentioned by several of the informants during Chapter 6.

Therefore, Zannetos (1965) finds that an organisation must always allow for different members of the team a period of time for learning and thinking, in which they will absorb the details of the decision and combine it with their own specialised knowledge. Moreover, the study finds that the actors should spend considerable time bargaining and arguing to reach a quorum before they should begin the planning process. Therefore a decentralised model must be considered, as the notions of the study align with the benefits of more decentralised structures (Brickley et al., 2015; Zannetos, 1965).

Although decentralised organisations and decision structures will empower managers and workers while letting information flow freely, there is a need for authority and a more centralised governing body with a mandate to supervise, monitor and ultimately challenge the decisions by other hierarchical members. As it can not be assumed that all decisions in an organisation will be correct and follow the vision of the company, it is strictly important with such a delegation of power (Zannetos, 1965).

While the previous theory and scholars are able to advance our understanding of the organisational contexts of decisions, we do see that there are still gaps in the knowledge of applicable models across public and private organisations. Moreover, scholars do not agree on the centralisation versus decentralisation discussion in regards to the level of decentralisation decision processes should have from the management. Recently, the literature has shown that business should step more towards empowering the employees than in former years (Brickley et al., 2015; Zannetos, 1965).

Although if employees should be empowered, it is important to have some employees with the power to stop and govern employees in their action, if the risk for the organisations become too high. Literature accepts these managers as being called 'Risk managers' and are often important assets for organisations to assess and monitor risks across several projects (Van Marrewijk, 2007).

This thesis have adopted the role of a Quality and Risk employee during the development on the artefact in Chapter 6.

2.5.2 Framework based decision structures

After having reviewed the available literature on organisations and decision making, we will taker a closer look at specific frameworks and structures that can assist in decision making. We will also look into computer-assisted decision-making systems. We will look into the available research on this topic, as we will need to quantify the advice given, into variables and mathematical models.

Decisions Analysis can be seen from two sides. Either the perspective is *prescriptive*, also called normative, meaning that we try to build a mathematical model, that can take in a large amount of the needed uncertainties and will, therefore, assist an organisation in taking a decision. Alternatively, we have the perspective of being *descriptive*, which implies that the scholars have looked at how the human make a decision and describe the process, therefore focusing on which inputs a certain model should have and how these inputs should be biased. Often a descriptive model is the foundation of prescriptive model development (Smith & Von Winterfeldt, 2004).

Descriptive models lay out the challenges that decision-makers should be aware of by analysing and describing human behaviour during decisions. General for descriptive models, is that they agree that there is a cost associated with the team decision making, that we have established the necessity for during the organisational literature reviews. These include free-rider problems in the form of some group members of the decision team, not performing as they should during the decision process, therefore leaving out the potentially necessary information. Moreover, the available literature explains the cost of managing decisions taken as teams and moreover monitoring decisions and reasons. If a decision that has been taken by a group turns out to have fatal consequences, the process should be visible and accountable, so the mistakes can be found and corrected and the right people informed (Brickley et al., 2015).

Scholars have also argued the rationality of individuals as well as their risk adverseness. It can be seen, that individuals often lack rational decision making when they are merely discussing different alternative decisions, as they would give unreasonable high emphasis on the risk in the decisions compared to the perceived gains from a certain decision. Therefore, scholars argue that people should be made aware of their own irrationality and be bound by certain systems or frameworks, that will more rationally and objectively judge each alternative

(Eisenhardt & Zbaracki, 1992; Smith & Von Winterfeldt, 2004).

Moreover, Eisenhardt and Zbaracki (1992) find that multiple scholars have agreed that political organisations, often take decisions based on pleasing the most powerful individuals or parts of the organisation, even though the decisions will not help the overall strategy or goal of the organisation. With this said, some scholars argue that regular employees do not care about political conflict in organisations, as they would rather like to challenge the political conflict with reason and data. Frameworks should support the decision making process with reason and data, but they must consider the political conflicts of an organisation (Eisenhardt & Zbaracki, 1992; Sharfman et al., 2009).

These rationality issues are also seen in decision making with multiple objectives, that are larger and simple decision making and contains upwards of 100s of decisions. In these scenarios, a hypothetical question for each alternative decision will allow for the quantification of that information which further drives a mathematical formula, that will be able to assist in choosing the best alternative. Scholars do also agree that decisions should not only be grounded on a cost-benefit analysis, as this does not account for political conflicts as well as external effects (Keeney et al., 1993; Eisenhardt & Zbaracki, 1992).

Decision Management Frameworks and Systems are not able to objectively rate complex decisions against each other, without entering objective data into the system, but as a decision process is based on uncertainties, there is no objective information, only subjective risk assessment. Therefore, the decision team should also rate the uncertainty of a number, instead of only the expected number (Keeney et al., 1993; Sharfman et al., 2009).

Furthermore, decision theory closely resembles game theory. During this thesis, we will assume a game with multi-person decisions, as we are concerned with more than two team members taking a decision. During these decision processes, coalitions can form, that e.g. would like projects with a lower risk, and therefore work together to overestimate the risks on certain projects. Therefore decision processes cannot always assume to be cooperative, but instead are assumed to be mixed-motive games. Therefore we should be aware of not only coalitions forming, but members trying to adversely participate in a decision. Moreover, the incentives in the organisation should be aligned to avoid adverse conduct (Kelly, 2003).

Analytic Hierarchy Process (AHP)

As a proposal to solve many of these issues regarding coalitions, politics and other decision analysis challenges, a framework called Analytic Hierarchy Process (AHP) has been proposed.

Tomas Saaty developed the Analytic Hierarchy Process framework during the 1970s. It has been developed for complex decision making and has been built on mathematical formulas and psychology. An example of AHP can be seen in Fig 2.5 consists of several criteria or variables that form up a ranking mechanism of a decision. Every alternative is then rated on these different criteria, so as the most qualified decision is being taken (Smith & Von Winterfeldt, 2004; Saaty, 1977).

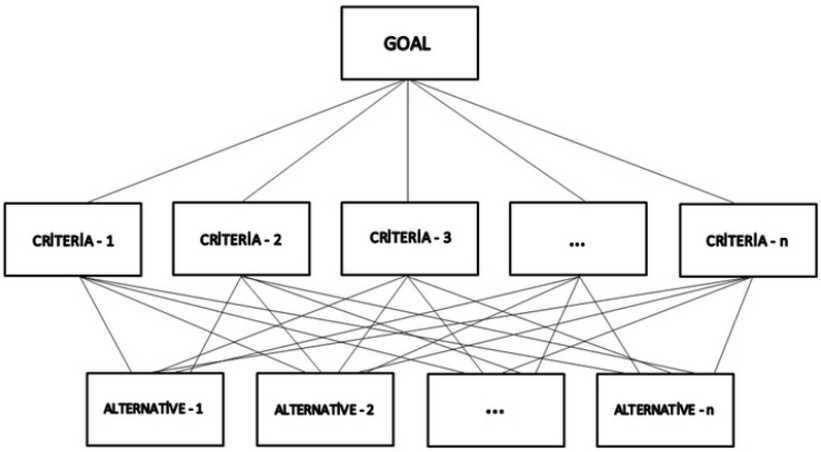


FIGURE 2.5: Visual overlook of Analytic Hierarchy Process (AHP)

The objective of AHP is to convert subjective measurements by individuals and teams into a quantitative measurement that can be used to compare different alternatives. The AHP framework, therefore, promises a full breakdown of a decision and better decision making (Saaty, 1977). In later chapters, it will be shown how these qualitative measures are of significant importance when automating processes with RPA.

After having evaluated the AHP framework, scholars have argued that it works best for decisions that are taken on a group basis (Saaty & Peniwati, 2013). Saaty further on describes that AHP is intended as a descriptive measure, as it has been developed upon procedures that would lead to decision outcomes. However, some scholars have argued that the framework should not be seen as a

descriptive framework, but instead, as a prescriptive framework, because the theoretical foundation of AHP is far away from an actual decision process and that it, therefore, does not take account of the constraints of a decision-maker (Smith & Von Winterfeldt, 2004).

Whether it is descriptive or prescriptive, AHP still stands as a decision making procedure, that has been build upon a somewhat normative foundation and that it sets up a guideline for selecting between multiple alternatives in a group setting (Smith & Von Winterfeldt, 2004; Saaty, 1977; Saaty & Peniwati, 2013).

Another critique of the AHP framework is that it is a 'one size fits all' approach to doing decision making and that it has unreasonable assumptions as to how the decision-maker thinks and acts, especially in a group setting, where the framework does not take things such as coalitions and political challenges into account. The impact is that several scholars, therefore, have rejected the AHP framework and other similar framework and instead focuses on more descriptive approaches that instead look at how other decision teams thinks and acts (Dillon et al., 2010; Nutt, 2006).

Some scholars have focused on solving some of the critiques that have been given to AHP. While Dillon et al. (2010) have argued that AHP only fits a narrow set of quantifiable decisions, Saaty (1977) has argued that the qualitative data should be turned into quantifiable numbers, to be used in AHP.

A peer-reviewed study has proposed that the decision-maker should instead be asked questions that are qualitative but then removes options that do not align with the answer to the question. Such a method would, for example, ask if a system should rather be interactive or not, which is not quantifiable, and when the decision-maker has answered the question, remove all options that are not e.g. interactive. Such a system would be able to pair well with AHP (Klein & Beck, 1987).

In support for the usage of AHP, scholars argue that AHP is merely a tool to find relative points to each other, as these relativistic equations are impossible to go through in the head of a decision team. Another critique has been put forth, that if a decision-maker uses AHP to choose between 10 different cars, in which the fastest car receive the highest point on the scale, i.e (10), and a new car is presented by Mercedes, that is 10% faster than the previous fastest car, should the decision-maker then change all previous grades given? A perfect solution to this has not be found, but it is instead a justified assumption to think ahead of future

options and alternatives so that the ranking method can contain better, cheaper or faster alternatives. Another proposed solution adds an extra grade (11), but that might change the ranking of other cars (Harker & Vargas, 1990). The scale of 1 to 10 has proven to be effective when making such estimations and is often used in agile project tools like scrum and planning poker (Calefato & Lanubile, 2011). Such scale will be used for similar estimations later on in this thesis.

Although the different scholars above have criticised AHP as well as defended and tried to amend several things in the AHP framework, it is nonetheless being widely used in business today, and the discussion regarding the usefulness of the system does still continue. However, there is a lack of literature regarding the success of long term usage of AHP based frameworks in business. Therefore the model should be seen as an inspiration, more than a peer-reviewed truth (Smith & Von Winterfeldt, 2004).

Of particular importance to this thesis when creating a prioritisation framework for RPA is Computerised Decision Support Systems (CDSS), which have emerged from the combination of computer software and decision theory.

CDSS has been highly beneficial in organisations that rely on digital information and have broad usage of computers in the organisation. The systems are often seen as more stable, flexible and ensures that standards are being kept. Moreover, CDSS' helps ensure full transparency in the organisation, as they often allow for decisions to be back-traced to understand the decision better (Varonen et al., 2008). CDSS has to be fairly well managed and structured, as they often have excessive or erroneous information (Alavi, 1982; Varonen et al., 2008).

Moreover, the systems often have difficulties containing all the relevant information, while ensuring that irrelevant information is not included in the system, as the system often contains fields that have to be filled out, even if it not relevant for the specific case (Alavi, 1982).

By combining AHP and CDSS, scholars have found that the information that the CDSS contain can be sorted by the algorithms that have been based on AHP. By applying both of these principles in combination, several of the challenges found in CDSS can be mitigated (Cil, 2004).

2.6 Summary

This chapter presented the theoretical background by reviewing some of the existing literature on the three overall concepts; IT Governance, Automation and Decision Structure. These concepts will provide the foundation not only for the analysis of the two cases at LEO Pharma and Skatteforvaltningen but also the design of the final framework for managing and prioritising automation projects.

Most definitions of IT governance revolves around the fact that IT strategy and business strategy should always be interchangeable and never be isolated from one another. There are different tools and frameworks an organisation can use to ensure alignment between IT and the business. In this chapter, a specific focus was on the ITIL framework, which provides some best practices for IT service management. The best practices in ITIL will both be used to create our framework, but the leanings that has been obtained from a framework like ITIL that has existed for more than twenty years will provide some key insights in how a framework that will be created in Chapter 6 can be adopted. The section highlights how it can be challenging to implement ITIL and best practice frameworks in general, as there rarely is any clear guideline on how it should be implemented. Organisations should instead look to adopt the framework incrementally to ensure successful usage.

Another main concern presented on ITIL is its complexity and the lacking indications on what processes are more important than others. To distinguish between critical and "nice-to-have" features, this learning is specifically essential when designing a prioritisation framework in this thesis. A central concept in ITIL is the CAB meetings, which is actively used in the change process both in IT and the business in general. The idea of these meetings will also be used actively when designing the framework.

Furthermore, the section on IT governance presented some findings on how organisations can realise their benefits in the most efficient way. One of the key factors is to distinguish between a problem based and an innovation-based implementation. This is important as managers should be aware of which approach is chosen and act accordingly if they want the realise the full potential.

The literature on automation presented some criteria that make a process suitable for automation according to the existing literature. Among some of the key criteria are routine tasks with a large number of transactions and the use of manual affordances. A rule of thumb states that a task is suitable if it is possible to

write down all the steps of the process, taking all possible events into account. Figure 2.3 showed a two-dimensional plot with four quadrants indicating the automation potential of a process. This plot substantiates the literature as the most beneficial quadrant is a process with a high degree of routine and manual affordances. Moreover, the literature states that a task involving several systems is specifically a good candidate for automation, but highlights the importance of the environment is stable in each of those systems

Finally, the chapter presents a review of the existing literature on decision structure. It shows how the complexity of a decision affects how strategic it is. This thesis will mainly focus on *rigorous* decisions that have a strategic implication on the organisation since a priority is to align IT- and business strategy.

The sections exhibited some benefits and challenges of centralisation vs decentralisation. These concepts will be used to design the prioritisation framework with the appropriate degree of decentralisation to ensure optimal use of local knowledge while still providing centralised governance.

Additionally, the section illustrated theory one how to build a framework based decision structure. A key concept that will be used from this section is a prescriptive system which attempts to build a mathematical model, that can handle a large amount of the needed uncertainties to assist the organisation in their decision making. Specifically, the theory on AHP will be used to create such a framework, as it aims to convert subjective measurements by individuals into quantitative measurements that can help compare differences between alternatives.

Chapter 3

Research Methodology

3.1 Introduction

During this section of the thesis, we will account for our methodological choices. The structure of this section will follow Saunders research onion (Saunders et al., 2016).

They created this onion to account for all the different choices that are to be made during a research project. By adhering to this guideline, we ensure to cover all relevant aspects of our research.
In Figure 3.1 you will see our modified version of Saunders Research Onion. The modified version contains the choices that we have taken to support our research. We will further describe each of these 'layers' in each of the following sub-sections.

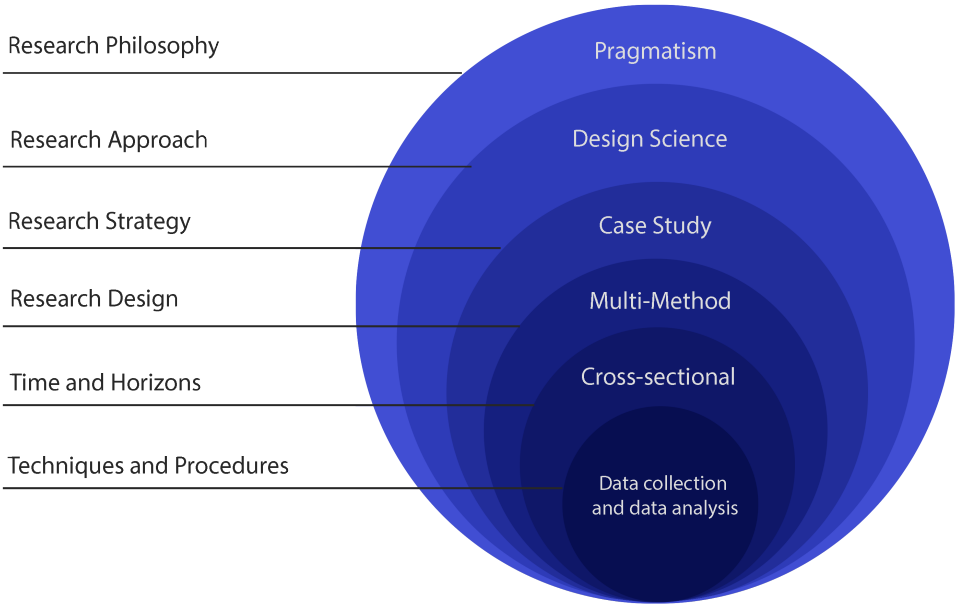


FIGURE 3.1: Modified version of Saunders Research Onion from Saunders et al., 2016

Scholars often engaging in Design Science will notice in Figure 3.1, that Design Science has been noted as a Research Approach in Saunders methodological model. Design Science can be argued to fit into either of the two categories of research philosophy or approach.

A. Hevner and Chatterjee (2010) argues that Design Science Research in the later years have started to develop into a research paradigm or philosophy, due to the argument that Design Science Research does not fit into any of the current research philosophies, but instead borrows philosophies from other paradigms.

We would make the argument, that due to our first pre-analysis of both our case organisations and the subsequent design science approach, we are first and foremost pragmatic researchers whom following the identified challenges starts the development of an innovative artefact to solve the challenges. The argument of Design Science as an approach is also made by Weber (2010).

The choices in Figure3.1 reflects the choices that have been taken to complete this study, but multiple other methodological choices could have been made to develop the study in other directions. Of the alternatives can be mentioned surveys for multiple organisations, that would have been able to give us a more broad insight into the challenges that have been seen. We have chosen to complete a case study, as this is more suitable to the subsequent design science research in which the organisations have thoroughly tested the artefact.

Moreover, an action research study would be viable to understand the challenges during an implementation phase of the proposed artefact during Chapter 6. Due to the scope and the organisational possibilities from the cases, we have decided to develop our artefact through a design science research approach, that will be validated rigorously to understand the possibilities and the challenges. Scholars argue that when developing cutting-edge artefacts through Design Science, failure would often risk the innovative approach to the design if an Action Research approach is chosen (Iivari & Venable, 2009).

Through the above methodological decisions, we will answer our research questions, in which we design and structure a framework to prioritise processes for automation with RPA.

3.2 Research Philosophy

During this subsection, we will describe how the pragmatic research philosophy will fit our thesis. The philosophical standpoint is covering the underlying beliefs and assumptions of the research and will affect every decision and thought during the process. From a growing number of research philosophies, we see the pragmatic world view as being central to the work of our thesis. The pragmatic view turns away from merely looking at quantitative research but also does not only look at high-level philosophical questions as other research philosophies do. Grounded in pragmatism is the desire to find concrete facts about the world around us.

> *"A pragmatist turns away from abstraction and insufficiency, from verbal solutions, from bad a priori reasons, from fixed principles, closed systems, and pretended absolutes and origins. He turns towards concreteness and adequacy, towards facts, towards action, and towards power."*
> (James & Burkhardt, 1975)

Before analysing the Pragmatic research philosophy and the impact on our thesis, we will have to define the two types of research assumptions that all research philosophies are based on. Ontology and Epistemology (Saunders et al., 2016).

The Ontology in Pragmatism is combining the world views of the positivist and the interpretive. While the positivist is bound to merely explain the observations the interpretive researchers is interpreting the observations through the social context. Instead, the pragmatist is interested in the changes and to influence both the individual and the system around them. This ontologist perspective is key for our choice of Research Strategy, namely Design Science Research (Ven, 2007),

The Epistemology in pragmatism is considering a multi-method data collection method best suited for understanding the organisations as well as the people interacting in them. The quantitative data grounded in conversations with the employees and actors in the organisation will allow understanding the challenges and solutions better. The qualitative reports that we have requested from the participating organisations will give us an overview of the organisation from a less rich and complex viewpoint, but with a better understanding of concrete numbers and choices that people have taken. This combination of knowledge allows us to legitimise most data sources (Saunders et al., 2016; James & Burkhardt, 1975).

As a summary, the importance of pragmatism is to offer change and action in the world, not to let go of other research philosophical boundaries, but instead to reconcile and use the views of each philosophy to contribute with practical solutions and change future practice (James & Burkhardt, 1975).

3.3 Research Approach

During this sub-section, we will describe our choice of research approach, namely Design Science Research. We will furthermore explain its significance in studies regarding Information Systems as well as its complementary characteristics in terms of our previous choices during this chapter on methodology. Furthermore, we will explain the abductive nature of our theoretical and empirical development.

The Design Science Research approach is inherently created to find and solve challenges in systems and organisations. It has grown from research in Information Systems. The strategy seeks to create innovative ideas and solutions to problems by studying challenges through information and theories that are tested and modified throughout the period of the study (A. R. Hevner et al., 2004).

A Design Science Researcher would argue that the theory and an effective artefact are two things with the same purpose, as research should be evaluated and defended through the practical implications that result from this. Moreover, for information systems, we acknowledge that technology and information systems are inseparable from the human nature of the users and people in the organisation (A. R. Hevner et al., 2004).

In Design Science, there are different targets for the researcher. These targets are 'improvement' in which a new solution is developed for a known problem. The 'invention' in which a new solution is developed to a new problem. 'Routine Design' in which a known solution is applied to a known problem. Finally, 'exaptation' is the target in which a known solution is changed to adapt to a new problem. The target of 'exaptation' is where we find our self in during this thesis, in which we apply AHP and CDSS to the new problem in choosing RPA projects among several alternatives. AHP has supported similar use-cases, but this use-case has not been combined with AHP before (Gregor & Hevner, 2013).

During this research, we will design an artefact in the form of a Computerised

AHP Framework, that will be based upon pragmatic input sources, from both quantitative and qualitative sources. These will be further described in the next section. The artefact will be evaluated through an abductive approach, in which we explore the artefact through both data and theory, revisiting both of these aspects multiple times during the study. To understand the usefulness of this artefact, we will follow design science guidelines by validating the output through multiple sources (A. Hevner & Chatterjee, 2010).
A. Hevner and Chatterjee (2010) have constructed seven guidelines that serve the purpose of conducting high-quality design science research. In the following, we will describe how this thesis is following the guidelines.

Guideline 1: Design as an Artifact. This study conducts the development of a visual artefact that will be shown to the case organisations through the three iterations.
Guideline 2: Problem relevance. Through the pre-analysis at both our case organisations, we will understand and validate the challenges that the organisations face.
Guideline 3: Design evaluation. Through multiple online workshops and interviews, we will validate our assumptions and the design decisions in every iteration.
Guideline 4: Research contributions. The specific theoretical and practical implications are discussed during Chapter 7.
Guideline 5: Research rigour. Through the established guidelines from Venable (2010), we have transparently described out mathematical calculations and put forth the full interview guide, that can be found in the appendices.
Guideline 6: Design as a search process. Multiple solutions have been proposed and discussed with both the case organisations and throughout the research process. Due to the scope of the thesis, not all discussions have been included, but most solution designs have been discussed during Chapter 6
Guideline 7: Communication of research. Following the guidelines from Gregor and Hevner (2013) the artefact must be understandable from both a business and a technical point of view. Both mathematical calculations for researchers as well as the visual design for management-oriented audiences can be found in Chapter 6.

It is important to note in this section, that our final artefact will not be generalisable to both public and private institutions as one model. There will be

challenges and problems in the final artefact. The final artefact need to be usable in the context of each organisation individually. Design Science research is grounded in the cases that the researcher is in, and therefore needs not to be easily used by any other organisation.
As per our research question, it is important in this study to understand the differences and the similarities between our cases, so that we can generate a generalisable computerised system, that can be customised to the specific cases that the researcher will find himself in (A. Hevner & Chatterjee, 2010).

During this thesis, we have chosen to approach the research with abductive theory development. Abduction is described as the approach in which you collect data to explore a certain phenomenon in which certain concepts and patterns exists. The findings will give us insights into faults and challenges in current theory as well as in current practice. Based on this, we will further develop the theory and test the new assumptions through additional data-collection methods (Saunders et al., 2016).

In the abductive approach, we are combining both inductive and deductive approaches, by moving back and forth into theory and data, thereby constantly revisiting our view of the world. Abduction is mostly used to uncover plausible theories, which is relevant for us, as we had some knowledge of the situation at both Skatteforvaltningen and LEO Pharma before the project started, in which we knew that the two different approaches could cause challenges.

In our abductive development, we have divided up our literature into concepts that describe the different areas that we need to uncover in the organisation. These concepts are further developed after the first round of interviews, in which we are revisiting the challenges in both the literature as well as the challenges in the current situation at the organisation. After revisiting the organisations, we will develop the theory as well as identify challenges with the organisations, thereby acknowledging and incorporating these two areas (Dubois & Gadde, 2002).

We have further described the concepts in Chapter 2, while we will further describe our interview patterns during the remainder of this methodological chapter.

3.4 Research Strategy

The case study is an in-depth investigation using qualitative research methods in which the researcher attempts to uncover social phenomenons and the actors in the organisations. Although the case study is mostly focused on qualitative research, scholars argue that quantitative supplementary information is often improving the study (Feagin et al., 1991).

During our study, we will accept this multi-method complimentary data need, as the case organisations have models and frameworks in a quantitative format that will provide great insights. This, will further be described during the next section.

Although some scholars would argue that case studies are rather difficult to generalise certain challenges from, others would argue that the strategic choice of the case is considerably improving the generalisability of a case study (Flyvbjerg, 2006). The strategic reason for the choice of the two case organisations will be further described during Section 3.7.1.

3.5 Research Design

Following the more philosophical questions during our research for the thesis, this sub-section will describe the design of our research, which includes our choice of data-collection methods as well as the purpose of the study.

The research design is the definition of how the researcher finds data that is to be used during the study. Some studies are grounded in qualitative data, in which interviews are often the most used method to obtain this data. Other studies are grounded in quantitative data, in which especially numbers or other results that can be analysed mathematically is the output data (Saunders et al., 2016).

The two described worldviews, the quantitative and the qualitative are often seen as strictly opposite. Researchers have combined these two worldviews in multiple studies. Moreover, multiple analysis methods are analysing qualitative data through a quantitative method and vice versa.

In the pragmatic paradigm as well as in Design Science Research, we see these two data-sources as complimentary. During this study, we will conduct qualitative interviews as our sample, as described during the 'Techniques and Procedures' section, but following that, we are often looking up numbers as well

as analysis that the organisations have conducted to understand and quantify the organisations.

Therefore, our approach to the research design is a multi-method analysis that acknowledges both quantitative and qualitative information and data.

Moreover, during the creation of our artefact that has been described in Chapter 6, we will analyse qualitative inputs through a quantifiable algorithm that is able to run on a computer, based upon the inputs and views of the informants. We will, therefore, have to rely on the combination of the different data-analytical models.

3.6 Time and Horizons

During this section, we will further expand on the time of our data collection in terms of the research as well as describe our time-limit in regards to this thesis.

Our first contact with Skatteforvaltningen was established more than two years ago when the first RPA projects were started. During that period, we have followed them loosely and understood their development. Therefore we do have some knowledge of the organisation before starting this study.
With that said, this research is a cross-sectional time horizon and is therefore not a longitudinal study in which we will follow the automation efforts in Skatteforvaltningen and LEO Pharma through a longer period. A key reason for this is the short time-span of the thesis-writing effort, that is limited to half a year instead of multiple years.

During our study, we will, therefore, gather both our quantitative and qualitative data sources concurrently, to develop multiple testable artefacts within a time-limited project. We are therefore using a concurrent mixed methods research in a cross-sectional time horizon.

3.7 Techniques and Procedures

During this section, we will describe our selection of case organisations and the informants as well as the usage of Management Consultants. Moreover, we will describe the interview techniques. We will also describe the coding and data analysis following the data gathering. Finally, we will describe the impact of the COVID-19 pandemic on our data gathering and what we have done to minimise the impact on the data quality.

3.7.1 Case organisations

Due to multiple members of the group working in consulting with broad knowledge to different organisations and their RPA efforts, we had a list of organisations in Denmark that could be interesting. Following that, we looked through some of the criteria for selecting appropriate case organisations. Mainly, we followed the criteria from Lee and Baskerville (2003) to select multiple diversified cases to enhance the generalisability of a study and therefore, the usefulness, according to the Design Science Research as well as the pragmatic paradigm (Lee & Baskerville, 2003).

Diversified organisations

LEO Pharma is an organisation that has a mainly decentralised structure in which the different areas of the business have a high degree of self-control. On the other hand, Skatteforvaltningen is an organisation in which there is a large degree of centralisation, even though the organisation recently have been changed to a more decentralised structure due to the creation of seven organisations, as described in Chapter 4.

Diversified organisation size

LEO Pharma is an organisation in which only a single person is employed with building robots within Human Resources (HR) up to three full-time employees in Research & Development (R&D). (LEO Pharma, Jesper, Appendix D). This is a rather small sample size, while Skatteforvaltningen has employed more than twenty people to build robots (Skatteforvaltningen, Tina, Appendix A). This makes Skatteforvaltningen more than twice the size of LEO Pharma in terms of robot development.

Diversified Markets

While LEO Pharma is a private pharmaceutical company with more than two-thirds of its employees placed outside Denmark, Skatteforvaltningen is instead a public entity run by the Tax-minister and almost all of their employees are placed in Denmark.

We, therefore, believe that the two organisations that we have chosen for the master thesis are diversified enough to focus on some degree of a generalisation in the final framework. The reason for not selecting more than two organisations is simply because of the scope and size of this thesis. As to still acknowledge other organisations than LEO Pharma and Skatteforvaltningen, we have also chosen to gather data from Management Consultants from KPMG, whom are RPA experts. These consultants have given us useful data to understand the situation and challenges outside our case organisations (Lee & Baskerville, 2003).

3.7.2 Selection of informants

During the beginning of the project, we had an initial unrecorded talk with each of the two case companies to understand their organisations on an overall level and to understand which individuals that would be able to contribute to the thesis. We did this by setting up specific key goals for each organisation, such as the need to have at least one business person and one developer from each organisation participating.

Following the first interviews with Tina from Skatteforvaltningen as well as Jesper from LEO Pharma, we understood that we had missed some key persons in each organisation during the first unrecorded interview. Therefore, we made changes to the schema and held interviews with Richo and Murssal from Skatteforvaltningen as well as Jens from LEO Pharma, as these people were outside the sub-organisations that we were focusing on. Furthermore, they were intertwined with the work of each of the two sub-organisations of our focus. Moreover, we were limited by resource constraints on behalf of the two organisations (Saunders et al., 2016).

Table 3.1 show the different informants in the project, as well as the job-titles and interview rounds. The interview rounds will be further described during Section 3.7.4.

3.7.3 Data collection methods

As previously described, this thesis is analysing data through a multi-method analysis and gathering data through concurrent mixed methods in a cross-sectional

Organisation	Name	Job-title	Interview-round
LEO Pharma	Johnny	HR Director	1
LEO Pharma	Jesper	RPA Specialist	1
LEO Pharma	Manos	Director of Process and Techonology in cooperate HR	1
LEO Pharma	Jens	Process Guru in R&D	1
Skatteforvaltningen	Tina	Chief Consultant of the automation Department	1
Skatteforvaltningen	Carsten	RPA Specialist and Lead developer	1
Skatteforvaltningen	Murssal	Employee in DigiPof	1
Skatteforvaltningen	Richo	Employee in DigiPof	1
KPMG	Mikael	RPA Specialist	2
KPMG	Kristoffer	RPA Specialist	2
LEO Pharma	Johnny	HR Director	3
LEO Pharma	Jesper	RPA Specialist	3
LEO Pharma	Manos	Director of Process and Techonology in cooperate HR	3
LEO Pharma	Jens	Process Guru in R&D	3
Skatteforvaltningen	Tina	Chief Consultant of the Automation Department	3
Skatteforvaltningen	Carsten	RPA Specialist and Lead developer	3
Skatteforvaltningen	Richo	Employee in DigiPof	3
Skatteforvaltningen	Murssal	Employee in DigiPof	3

TABLE 3.1: Participating informants and interview rounds

time horizon. This is in line with the Pragmatic paradigm as well as Design Science Research. Moreover, we have chosen to mainly conduct semi-structured interviews, as our target as researchers are to uncover issues and challenges within the current environment in the organisation. By setting up themes and concepts in our interviews, we do steer the conversation towards relevant topics while still allowing the respondents freedom to tell some sub-stories to the general concept. This has allowed us to uncover several challenges (A. Hevner & Chatterjee, 2010; Saunders et al., 2016; James & Burkhardt, 1975).

During our semi-structured interviews, we have followed Robyn Longhurst's guidelines on achieving an objective interview-situation (Longhurst, 2003).

> *"I would not necessarily ask these questions in the order listed. Allowing the discussion to unfold in a conversational manner offers participants the chance to explore issues they feel are important. At the end of the interview or focus group; however, I would check my schedule to make sure that all the questions had been covered at some stage during the interview or focus group."*
> (Longhurst, 2003)

We followed the questionnaire list set out in Table 3.2. We did follow it sporadically as we tried to welcome the informant into a situation where they felt comfortable sharing things that they thought relevant to the challenges instead as to adhere to the above quote.

Moreover, we asked to meet the informants in their 'own home' which in this

Skatteforvaltningen	**LEO Pharma**	**Question**	**Theory**	**Concept**
Tina, Murssal	Manos, Jens	Would you say (..)?	IT Governance	IT benefits
Murssal	Jesper, Jens	Which criteria(...)?	IT Governance	Automation criteria
Carsten	Johnny	What factors (...)?	Automation	RPA Criteria

TABLE 3.2: Interview guide sample

Please note that the following columns are NOT included in this table; Sub-part of theory, operationalisation, expected output. Please find the full interview-guide in Appendix P

case is their office, as to give them the setting where they are closest to the issues at hand.

Before each interview, we have informed the informants that we are recording it and will be transcribing every word they say. This has changed the behaviour of some of the informants, as they have given more information after the recorder have been turned off. These are things that they had in their heart but did not want to be traced back to them. We have, therefore decided not to use any inputs outside the recording in this thesis.

Before the interviews, we created a list of all interview-questions that are to be asked and assigned the questions to each informant as well as linked them to the relevant part of the theory that we wanted to uncover. Table 3.2 illustrates a small part of our interview-set and a small subset of our columns. The full interview-guide can be found in Appendix P.

To minimise any potential language barriers, we decide to interview each respondent in their native language. For most of them, this was in Danish, but a couple was conducted in English. Language differences can have consequences in a research, as concepts in one language may be interpreted differently in another language. Particularly in qualitative research since it works with word and language is a key factor in data collection, analysis and representation of the textual data (van Nes et al., 2010).

Opposed to conducting all interviews in English, this approach ensured that all the concepts were understood and interpreted correctly by the respondents.

For the readability of this study, every Danish quotes have been translated into English to the best of our ability, while still attempting to capture the tone and the phrasing of the interviewees.

Following the initial interviews, we have held design thinking workshops, which is an important tool in Design Science Research as this method uncovers flaws

and solutions in an artefact. Instead of merely asking questions about the artefact, we work with the informants to solve the issues directly in the prototype (A. R. Hevner et al., 2004).

As our data-sources are not only qualitative, we do also have some secondary data in terms of quantitative Excel-sheets and other documents, that contains the current practices and mathematical models being used internally in the organisations in the selection process. The documents from LEO Pharma can be seen in Appendix R, S and T, and the documents from Skatteforvaltningen can be seen in Appendix U and V. They are especially important because they contain the current weights and criteria for receiving a good prioritisation and might uncover other challenges in the organisations.

3.7.4 Interview journey and the challenges with multiple organisations

One of the challenges of the interview process was that we needed to start at one organisation, thereby changing our opinions before interviewing the next organisation. This posed two critical challenges.
1. As we gained knowledge at the first organisation, we have been able to gather more information at the second organisation.
2. As we asked questions to the first organisation, we removed some questions that might have been valuable at the other organisation, but they were changed to questions that we knew were important.

During this research, the first organisation that we talked to was LEO Pharma. The organisation gave us valuable insights into how decentralisation and centralisation changed the entire setup regarding RPA, and therefore we changed our focus when visiting Skatteforvaltningen, to understand how they managed the centralisation versus decentralisation dilemma.
To counter these two effects on our interviews, we did create all of our first-round interview-guides before the first interview was held and only allowed a few changes.

As described in the previous subsection, we did hold design thinking workshops with both organisations. In these workshops, we showed our artefact and changed it based on the feedback. Again, we gained knowledge of the faults in the artefact following the first interviews and therefore, we might have changed

focus to some of the faults that was uncovered in the prototype during the following interviews. While it might have had an impact on the research, analysing and changing the artefact for the better is a part of our Research Strategy, and therefore the consequences are positive (Gregor & Hevner, 2013; A. Hevner & Chatterjee, 2010).

Unfortunately, the workshops that have been held during the thesis have been held online, which has limited the understanding between the informants and made the situation difficult. Moreover, the poor internet connection among some of the informants made it difficult to understand each other as well as limited the sharing of screens.

Following the conclusion of the interviews, the relevant quotes have been included in the thesis and the informants that have asked to review the quotes before hand-in have been able to do this. No quotes have been changed or removed due to this agreement. No other agreement has existed with either of the organisations. We have, therefore been able to conduct the study neutrally and have not experienced any pressure.

3.7.5 Coding

Following each transcription of an interview, we coded the interviews into different concepts and themes, that either should be considered during the analysis, had a direct impact on our artefact or opened up for further questioning in the next interview-round, the management consultants or already during the current interview-round in which the coding was done. The coding was done following the advice of Meghan Cope (Cope, 2010).

The coding assisted us in understanding the challenges experienced by the organisations and subsequently assisted in answering our research questions and designing a framework to prioritise processes that are suitable for automation with RPA.

Figure 3.2 describes a subset of our main themes during the coding phase as well as an example of how the text has been coded from some of the interviews. Note that some parts of the interviews have not been coded, as these parts are seen as less relevant relative to other parts of the interview.

The coding phase made us able to see patterns across different informants as well as group certain criteria together, to understand them in relation to each other.

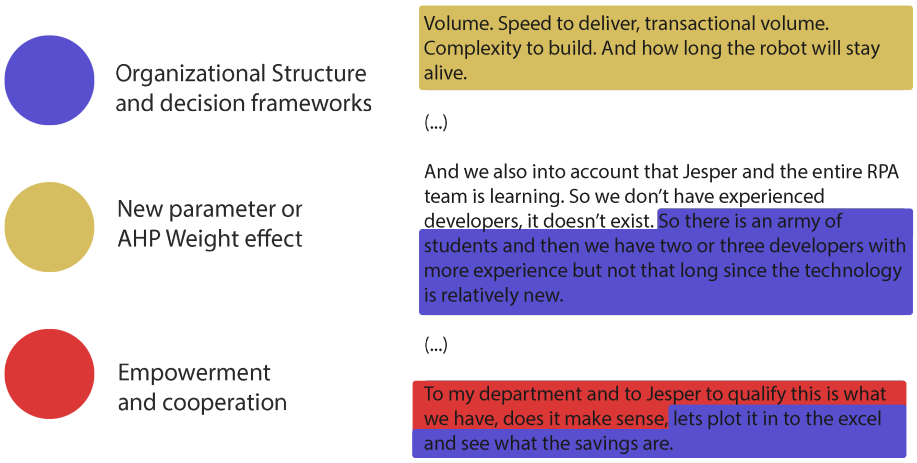


FIGURE 3.2: Visualisaton coding structure sample.

The three concepts are only a subset of the final number of concepts.

Following the coding of the interviews, we gathered different quotes for different concepts in large files so that they could be read together, and patterns could be found. An example of a pattern found is the challenges regarding political pressure that came in multiple different quotes, but when gathered together created a large group of challenges with pressures that are not rational in terms of business cases.

3.7.6 Benefits and challenges of a three-person group size

During this master thesis, we have been three researchers that have cooperated on developing an artefact to answer our research questions to prioritise the suitable processes for RPA. As the group size is rather rare in master thesis, this subsection attempt to uncover the methodological consequences of the study.

Due to the group size, we have been able to observe our informants more thoroughly during the interviews. We have utilised the group size through specific roles during the interviews. One researcher has been the primary interviewer and asks the questions. Another researcher takes notes on a shared notebook that the last researcher is continuously reading and based on that, generating new questions that have been asked following the fixed interview guide. These questions attempt to answer irregularities in the interview of point of interest

that have come up.

Moreover, we have been able to review the theoretical concepts that have been developed in our literature review. More information on this can be found in Section 2.2.

Following the COVID-19 Pandemic, we have chosen not to sit together for a prolonged period of approximately one month. This decision was taken due to the group-size and the possibilities of virus infections. Another challenge that has been identified is the number of discussions. The discussions in the group have both heightened the academical level but also slowed the process, as we actively sought to achieve consensus and not a tyranny of the majority.

3.7.7 COVID-19 Pandemic

During our first interview-round at the end of February and the beginning of March, Denmark started to close down different parts of the country, while finally on the 11th of March closing down public and private organisations.
The COVID-19 Pandemic created multiple challenges for us. In relation to the described methodological choices, we have primarily identified two challenges.
1. As per the guidelines of semi-structured interviews, the researcher have to make people feel at home and be calm. This was difficult during the first phase of the pandemic, as people were on their nerves and kept to themselves.
2. Following the closure of all organisations, we were forced to change the planning and finally to conduct interviews by Microsoft Teams. Some of our informants could not turn on the camera, and we were therefore not connected to each other as if we were in a room. Moreover, they were not in their usual workplace.

We have been aware of the consequences of this thesis, but have tried to minimise the consequences by using video-cameras and tried to keep the interview-procedure as ordinary as possible. We did conduct most of our interviews before the complete closure of the country, therefore limiting the impact. However, the final iteration of designing the artefact was mainly affected by the lock-down. Since it was not possible to arrange a workshop with multiple informants from each organisation as recommended in a design science study, we had to conduct virtual workshops with one informant at a time. This, of course, limits the analysis to some extent, but it was a satisfying alternative considering the circumstances.

Moreover, multiple informants had to cancel and postpone interviews with us due to the lock-down of the workplace and the change of location. Furthermore, we experienced several informants that had to leave the interview before all our questions had been answered, primarily due to children and family. Unfortunately, not all of the interviews have been fully concluded due to lack of time from some of the informants following the premature conclusion of some interviews.

3.8 Summary

As seen in Figure 3.3, this Master Thesis will seek to understand the current challenges that we observe in the case organisations, through both qualitative data as well as quantitative interviews with the relevant informants. Furthermore, we will validate our understanding of the case organisations through interviews with RPA experts from KPMG NewTech.

This thesis will be grounded in the pragmatic paradigm. First, we will conduct a case analysis in which we seek to uncover the challenges of the organisations. Following this we will perform a DSR study to outline a solution to the identified challenges. As this thesis build upon a cross-sectional mutli-method data-collection, we will conduct numerous interviews as well as gather secondary data from the case organisations.

To guide our empirical collection, we will use the theoretical foundation from our three concepts, that covers Automation, IT Governance and Decision Structure.

During the development of the artefact, we will conduct three different cycles of data collection through design science research. All the cycles will move back and forth between the theoretical and the empirical evidence gathered to validate and understand the challenges. The first cycle is characterised as a relevance cycle, in which we seek to understand the organisations and propose solutions in co-operation with them. In the following cycle, we further seek validation and empirical evidence. The final iteration seeks to gather the final feedback from the case organisations and test the validity of the computerised AHP prototype. The artefact will be used to answer our research question, in which we design and structure a framework used for prioritising processes that are suitable for automation with RPA.

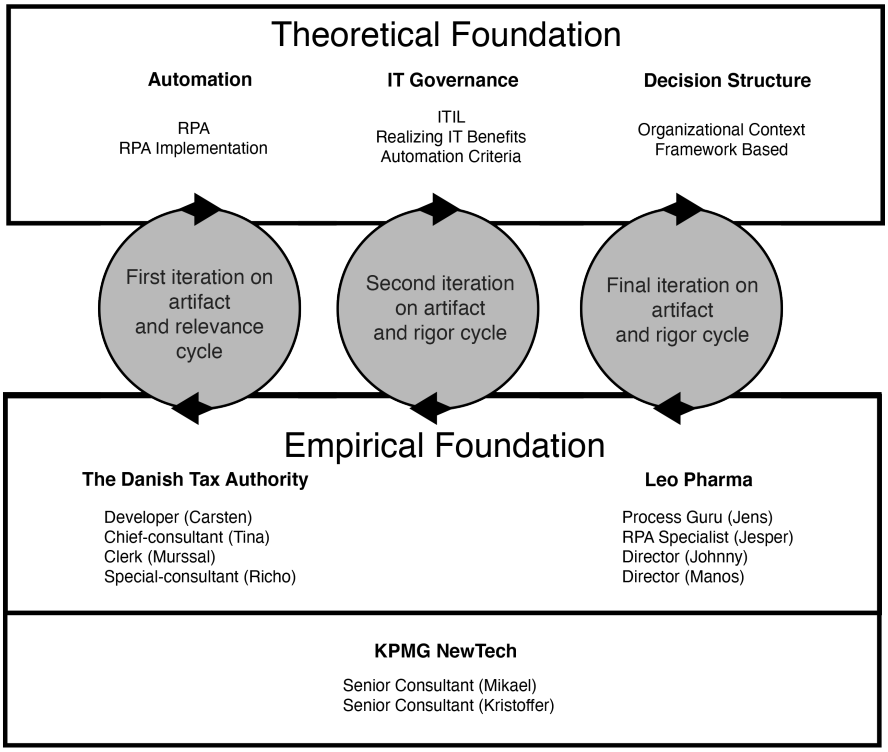


FIGURE 3.3: Overview of methodological choices and practical implications

Chapter 4

Case Description

4.1 Introduction

During this chapter, we will describe and present the two case organisations that have been researched in this thesis. Moreover, we will also present the informants that have assisted in the project as well as their official job-titles in their organisations.

Following this chapter, we will further analyse the issues and challenges that have been found in each of the two organisations.

4.2 LEO Pharma

LEO Pharma A/S is one of the largest Danish pharmaceutical company along with Novo Nordisk and Lundbeck. It was founded in 1908 as *Løvens Kemiske Fabrik* by the pharmacists August Kongsted and Anton Antons. In 1984 the company was bought by the LEO Foundation and changed the name to LEO Pharma. Today the foundation represents the sole shareholder of LEO Pharma, independent from heirs, outside shareholders, and other interests. Besides the ownership of LEO Pharma, the foundation owns financial assets of around DKK 14,5 billion and the main objective of these investments is to support LEO Pharma's long-term strategic development, as well as to fund the philanthropic activities of the foundation.

The company itself consists of almost 5700 employees worldwide, with around 2000 being in Denmark. Besides Denmark, the production is placed in Vernouillet in France, Dublin and Cork in Ireland and Segrate in Italy. Their product portfolio consists of medicine for skin diseases, STD's and prevention and treatment of blood clots. In 1917 the heart medicine Digisolvin became the first danish pharmaceutical product to be exported. Since then, several different products have been launched by LEO Pharma to prevent fatal diseases all over the world.

Today, LEO Pharma has an ever-growing pipeline with over 4,800 specialists focusing on developing these medical drugs.

Researchers represent a significant part of LEO Pharma since this is where the main value is created for a pharmaceutical company. Also, since there is a long way from an idea to launching a new product in the medical industry, this area, in particular, requires additional resources.

> *"Then there is someone who has research, it is very big in LEO, this is where we earn our money, and there are a very long from idea to money when producing medicines. There are many trials to go through in order to go for approved drugs, both on animals and humans."*
> (LEO Pharma, Johnny, Appendix F)

To support their core competencies, LEO Pharma has several different departments or GLB areas as they call them. Among some of these areas are Human Resources, Finance, Research and Development (R&D) and IT. All of these areas are developing software robots independent of one another and are allocating different resources to the development of RPA. However, every unit is using the RPA software Automation Anywhere.

In HR, they are currently rolling out a new global HR system, resulting in them only having one employee developing RPA, namely one student assistant as their lead developer. R&D is the largest area focusing on process improvement and process automation with eight people in a mixture of full-time employees, part-time employees and external consultants. The IT department does not develop any RPA themselves, but a center of excellence has been established in this area, responsible for hosting the RPA platform and supporting with the infrastructure as well as education in general.

> *"The way we set it up here at LEO Pharma is that we have a CEO who has the platform and helps with pilot projects, and helps with what we call a VIA unit, a Virtual Agent Unit in each department. They help with the setup of the VIA and training afterwards."*
> (LEO Pharma, Jesper, Appendix D)

The differences in the amount of RPA resources also shows, when assessing how these departments identify and prioritise their process pipeline. In HR, their focus has mainly been to set out fires, by identifying the potential process that could be automated as fast as possible to show some results. This also means that focus on mapping, assessing and prioritising the processes have been limited.

> *"I have a lot of autonomy, so if I have a process I think can be automated, then I talk to the payroll manager or HR operations manager, and ask what they think about it."*
> (LEO Pharma, Jesper, Appendix D)

This approach has already resulted in some unsuccessful projects as the processes was not mature enough to be automated. R&D, on the other hand, has created a more solid framework, including tools to keep track of their project backlog, mapping processes in workshops and prioritising projects.

In this study, the main focus is HR and R&D as these are the two departments that have been interviewed. However, as the departments do work together to some extent the interviewees have provided some information on the other departments, which will be used throughout the following analysis.

Table 4.1 gives an overview of the employees interviewed in Leo Pharma.

Name	**Jobtitle**
Johnny	HR Director
Manos	Director of Process and Technology in cooperate HR
Jesper	RPA specialist
Jens	Process Guru in R&D

TABLE 4.1: Organisational diagram of LEO Pharma A/S

4.3 Skatteforvaltningen

Skatteforvaltningen is a part of the Skatteministeriet, which also includes the Skatte depertamentet and was in august 2018 divided into seven Agencies; Skattestyrelsen, Toldstyrelsen, Motorstyrelsen, Gældstyrelsen, Vurderingstyrelsen, Administrations- og Servicestyrelsen and Udviklings- og Forenklingsstyrelsen. In addition, Spillestyrelsen and Skatteankestyrelsen are also a part of Skatteforvaltningen. Skatteforvaltningen raises almost 1,000 billion DKK every year to finance the financial sector. Skatteforvaltningen had some unfortunate cases in recent years which include both dividend tax issues, but also challenges with implementing several IT-systems. These challenges have led to the creation of these seven agencies. The tasks in the tax area require high competence requirements because tax law and practice are comprehensive and must regulate a myriad of matters of high complexity.

When the Danish government decided to divide Skatteforvaltningen into seven agencies, they also decided internally that only one agency will develop systems and maintain current systems. This agency is Udviklings- og Forenklingsstyrelsen and the agency supports the development of a reliable organisation. The agency's core task is to maintain existing IT systems and develop up-to-date and future-ready IT solutions for all the agencies. This includes the development of robots. The tool Udviklings- og Forenklingsstyrelse uses to develop robots, is Blue prism. Udviklings- og Forenklingsstyrelsen has five disciplines, which are further divided into 13 sub-business units. All disciplines each have their own responsibilities and under data and analysis is a sub-discipline called Process Automation. In this field, they assist the various agencies in automating manual and standardised processes.

All agencies can have their processes automated, but the Process Automation Department cannot automate all projects that are submitted and therefore, they have to prioritise which projects to automate. The largest agency is Skattestyrelsen, and they currently own half of the automation projects. Due to their size, they have their own department, called DigiPof, which prioritises their internal projects before they are sent to the department called Samarbejde og tværgående styring (STS). The other agencies have a person who is responsible for submitting the projects to STS. This is typically a director or a sub-director of the actual agency. Once all the projects have been submitted to STS, they send a list of prioritised automation projects to the estimation committee, and they estimate the costs to

perform the automation. The estimation committee consists of developers and process consultants who assess the time to perform the automation. After that, it is the prioritisation committee that makes the list of priorities, and this committee consists of sub-directors or directors of each of the agencies that exist in Skatteforvaltningen. In addition, STS participate. Once they have prioritised the projects, they are sent to the automation department, and the development of the robots will start.

Since Skatteforvaltningen is a public organisation, there are often regulatory requirements that determine the work that the process automation department must do. This means that a legal automation task will always have top priority, meaning that the other tasks that otherwise had a high priority will be given a lower priority, and other tasks will not be automated at all.

> *"... If there are political priorities, there are some legal bindings, etc. It also makes it a priority."*
> (Skatteforvaltningen, Tina, Appendix A)

> *"If they answer 'Yes' to legislation and political, then they will also be asked to refer to what law if it is a law. After all, most of those who are put into laws will be prioritised high."*
> (Skatteforvaltningen, Richo, Appendix C)

As shown above, both Richo from DigiPof says that legislative projects score the highest, and also with Tina, who works in the automation department, that legislation scores high and is often given the highest priority. This study will focus on the priority model of the automation department, where their priority model will be compared to literary theory. In addition, there will be a focus on how the estimation committee prioritises the incoming projects. The key informants interviewed at Skatteforvaltningen are mentioned below at Table.4.2

Name	**Jobtitle**
Tina	Chief Consultant of the automation department
Carsten	RPA Specialist
Murssal	Employee in Digitisation Portfolio and Business Department
Richo	Employee in Digitisation Portfolio and Business Department

TABLE 4.2: Organisational diagram of Skatteforvaltningen

Chapter 5

Case Analysis

5.1 Introduction

After presenting Skatteforvaltningen and LEO Pharma as the two case organisations in the previous chapter, this chapter will build upon the description in the former chapter and analyse the challenges that have been found in the organisations. These challenges have presented themselves as being an issue in line with the literature, or because some employees have expressed differing views on some things. Some informants have also expressed their discontent with some things in their organisations, which will also be discussed during this chapter. The purpose of this chapter is to create a solid foundation before starting the design of the first artefact in the next chapter.

The chapter will not analyse the specific parameters that are used to rate the processes in terms of the theoretical framework, as that analysis will be done in the Chapter 6.

5.2 LEO Pharma

5.2.1 Automation-prioritisation criteria

When prioritising automation projects, chapter 2 described some criteria that made a process suitable for automation that most firms should be aware of. As mentioned in the previous chapter, there was quite a difference between how HR and R&D prioritised the projects in their pipeline. In HR, a lot of the potential processes have not been identified yet, due to the lack of resources allocated to RPA. They have not been able to build a pipeline of processes, that would require a strict prioritisation on how they utilise the resources in the best way. Up till this point, potential processes have been identified one at a time by the student assistant who is the only employee working on RPA in HR.

> *"So, the way we have done it so far is that we have had some processes that I have known and that I believe are candidates to automate. So we have had some on- and off-boarding activities, for example, which I knew that could be collected in one way or another and they have the same data, and when the processes are ready, it can be automated."*
> (LEO Pharma, Jesper, Appendix D)

The HR department did have an excel document which functioned as an assessment tool, that should indicate how much value an automation project could create. However, the above quote indicates that this assessment tool was not used to prioritise projects against each other but rather justify the time they decide to spend on the project. An explanation for this way of operating is that HR is very early in their life of developing RPA. Several of the early projects was not only built to maximise the potential value but also as a proof of concept to show the department and the entire organisation what they could do with the technology.

> *"It is not sure we make this robot because we would like to save x number of hours. We might as well say we make it for some proof of concept, and then our HR department gets it away from their desk and to show the potential of this tool."*
> (LEO Pharma, Johnny, Appendix F)

The HR director additionally adds that one of his main priorities is to educate the employees and built a knowledge base around RPA. A more strict prioritisation framework will then be important when LEO Pharma is more mature on the concept, and their pipeline of processes is growing. At this point, the potential of showing what the technology is capable of could be far more valuable than maximising time saved in the HR department in Denmark. Hopefully, the potential from RPA could spread to the global HR departments in LEO Pharma, making it even more beneficial. The HR director did still mention some criteria he focused on when evaluating the potential of a robot.

> *"For me, it is more like a logical point of view, where you can say, where there are non-value-adding processes, moving data from one system to another, reporting things to public authorities and just taking some data in a report, and open a portal somewhere to the public and enter data. It is the repetitive manual tasks where there are no humans does not add extra value to it."*
> (LEO Pharma, Johnny, Appendix F)

The Director of Process and Technology in HR confirm these criteria as he described how processes with a high number of transactions were explicitly attractive for the HR department to automate. These criteria where some of the most important ones when they launched their first robot, that should automate several manual processes in HR when LEO Pharma hired new employees. There are more than 400 new hires every year, which requires a large amount of repetitive work. Additionally, he adds that the time a robot will stay alive is also a significant factor in how good the business case is. The business value is diminishing if a robot is put in production just to be shut down because a system is being replaced or the process is no longer relevant. This would not be a good look when showing what the capabilities of RPA are to the entire organisation. He also questions what the data in the assessment tool actually can provide by describing that some benefits can be more intangible.

> *"When I said what do you actually put into that excel. Until that time, until we build the robot, the synchronisation was happening every two weeks. The business would complain why do you do it that often or that late. Now we can do it every day."*
> (LEO Pharma, Manos, Appendix E)

To the question whether their current assessment tool is too simple, he answered "yes", indicating that it did not account for many factors that are more difficult to measure. As the quote above shows, one of these factors could be internal satisfaction among their employees. Additionally, he adds that the current way of identifying processes where they are trying to put out fires is not necessarily the best in the long term.

> *"How it should be in the future: We should work together with operations to identify large transactions or activities. Moreover, based on that prioritise, what should come first and what should come second. So right now we are trying to cater and free up as much time for operations as we can. We are not necessarily doing long term choices."*
> (LEO Pharma, Manos, Appendix E)

In R&D, their way of prioritising is a bit more structured. Since their backlog is at a bit larger scale, they needed a framework that can assure them that they are prioritising the right projects. In the initial phase called *backlog refinement* they have workshops with some of the subject matter experts (SME) in the business to identify the landscape of the potential processes and what their benefits are. Jens explains how he, in some of those workshops, have tried to illustrate the potential benefits and their costs in a diagram.

> *"In some workshops, I have done this two-dimensional diagram where we have the potential benefit of automating this process and the potential complexity or cost of automating. And you get these four quadrants where we try to focus on the good quadrant."*
> (LEO Pharma, Jens, Appendix G)

The diagram mentioned in the quote above is very similar to figure 2.3 illustrated in Chapter 2 but with benefits and complexity defining the automation potential. According to Jens, the proper quadrant, in this case, would be where the highest level of benefits are obtained with the least amount of complexity. Talking to the developer in HR and R&D, they both defined one of the factors of the complexity to be the number of systems. The more systems the robot has to go through, the higher the complexity. Especially in a pharmaceutical organisation where the compliance level is very high. Several of the employees interviewed in LEO Pharma highlighted how the level of compliance often extended the time of developing a robot with multiple weeks. Even after the developing is finished, they would have to wait a significant amount of time before deploying the robot.

> *"Here we have so much compliance red tape, that is increasing the time needed to deploy. So that also makes it less attractive. Here it might take eight days because 2 Is development and 6 is documentation."*
> (LEO Pharma, Manos, Appendix E)

To help overcome the level of compliance, the interviewees mentioned how reusability was an essential factor when estimating the complexity of a project. One of the reasons being that it reduces the actual time it takes to develop a robot if you can reuse some parts from a previous project. It also reduces the compliance requirements, as a lot of the documentation is already made and approved for that particular part of the project. Manos even raises the question why this level of compliance is needed, when a robot is simply just moving data from one system to another, and all the documentation and paperwork are already done for these systems. But as this is the case right now and the prospects for a change in the level of compliance are unrealistic, LEO Pharma has to adapt in other ways. Besides focussing on reusability, they also mention how they are attempting group processes that could be handled by one robot.

> *"... but when I look into it, I try to see if I can find some synergies and find some things, so I make one robot that can handle many things."*
> (LEO Pharma, Jesper, Appendix D)

Making one robot that can handle a larger pool of processes is also an attempt to avoid the compliance process or at least reduce the amount of time you have to go through it. Another factor when discussing the complexity of an automation project are some of the law specific requirements in the pharmaceutical industry and specifically, if a process is involved with GxP, which are some of the good practice guidelines in terms of manufacturing, laboratory, documentation etcetera. If a process falls in the GxP category, the complexity will be increased significantly, as the compliance requirements are even more strict in that case. If the benefits of such projects are not correspondingly high, they will often not be prioritised.

In contrast to HR, they also spend much time mapping the processes in R&D. This includes how standardised/rule-based and how well documented the process is. If it does not satisfy their requirements, they will have to spend extra time in the initial phase trying to make the process suited for automation. This is something that should be taken into account when prioritising, as it increases the time to deploy.

5.2.2 Robotic Governance

As mentioned in Chapter 2 one of the most important things in IT governance is how well the IT strategy is aligned with the organisation's overall strategy. The fact that each department in LEO Pharma are responsible for their own RPA development has made their attempt to follow an overall strategy limited. They have been more focused on creating fast results, gaining valuable experience and proving their worth to other departments in Denmark and other countries, than prioritising the right projects based on optimal benefits and following and overall strategy. However, Johnny mentions that they should have a more governed model in the future, where they are trying to align the potential of RPA with LEO Pharma's strategy.

> *"I think the next step will show RPA being a strategic priority where a more centralised approach is adopted, which includes more centralised governance and a higher connection to LEO Pharma's strategy."*
> (LEO Pharma, Johnny, Appendix F)

The fact that each department is developing independently of one another makes it very difficult to follow one common strategy. Each department has the rights to set their own strategy, which has resulted in them pursuing their own goals and not LEO Pharma as a whole. Even though a center of excellence has been

established in the IT department, there is no clear government/transparency between the work done in each department. This is not only on the strategic level but also on a more operational level when developing the robots.

One of the problems that have happened is HR prioritising their resources on developing a project, to find out that the finance department was developing the exact same robot. This was discovered very late in the developing process, which had cost them a lot of wasted resources at that point. Having a more transparent model where the departments could see what everyone is working on would not only prevent such mistake from happening again but also contribute to a higher degree of knowledge sharing. It might even contribute as a source of inspiration for a department if they can see what others are working on. In the interviews with Johnny, he even expresses a wish that the future of their work in the RPA field would include a higher level of governance. A reason why there is a lack of robotic governance in LEO Pharma could be that the top management in LEO Pharma doesn't provide the appropriate awareness to RPA yet.

> *"I think it is very decentralised driven so if we talk to the management, as in the top management, then I do not think the top management yet has caught the potential it could possibly give."*
> (LEO Pharma, Johnny, Appendix F)

As the quote above shows, Johnny does not get the idea that the top management is aware of the potential of automation in LEO Pharma when asked whether automation projects are getting the appropriate awareness from the management. To the same question, the developer in HR answered *"No"*. This also indicated why the main focus is to show some quick results and display what the technology is capable of to get the management more committed. The lack of awareness from the top management is also expressed in the number of resources allocated to each department. In most of the departments, only one or two FTE's has been allocated, and in HR they are putting all resources in one single student assistant. It is only in R&D it seems like a strategic decision of putting the appropriate effort in RPA has been taken. Although, even R&D, where most of the commitment to RPA has been placed, almost three-thirds of the department are external consultants. You could argue that putting in this amount of resources does not create the best foundation for making the right decisions when it comes to prioritising automation projects.

When attempting to realise benefits from IT projects as well as RPA, it is important to identify whether the projects er problem based or innovative. In LEO

Pharma, most of the projects till this point has been problem-based as they in their own words are "trying to put out fires."

> *"So I would say how it should be and how it is now. How it is now: Realistically we are putting out fires, so we go to operations and say "guys do you have something that has huge transactions"."*
> (LEO Pharma, Manos, Appendix E)

Once again, the reason that the problem-based approach is dominant in LEO Pharma is the fact that they still are not very mature in technology. The majority of the respondents do, however, express a hope, that the future will bring opportunities for more innovative initiatives when it comes to robotics. In R&D, they even had a column in their excel assessment tool called *generating new opportunities*, but when asked when was understood by that column, Jens answer was: *"I am not sure... I am not sure what that could be* (LEO Pharma, Jens, Appendix G). This clearly shows that this has not been their main focus in the RPA journey so far, but it at least shows that it is something that they have discussed, which could become important to be aware of in the future. Overall their priority has been on processes with a large number of transactions which requires much repetitive work.

5.2.3 Decision Structure and Framework

Looking at the decision structure in LEO Pharma Pharma, it is very decentralised when it comes to developing RPA. As mentioned earlier, each department is responsible for their own work in the field. They are even responsible for hiring the number of employees they choose to allocate on robotics themselves as well.

> *"No, we can decide locally if we want to hire three more to do it. I was a part of the project when it started up. It wasn't something that was necessary at a management meeting, and it was decided that LEO Pharma should use robots."*
> (LEO Pharma, Johnny, Appendix F)

As mentioned in Chapter 2, there are several benefits and challenges with building a structure like this in an organisation. One of the more important ones, in this case, is the difficulty in aligning the decision making with the overall vision of the organisation. This would require higher management in LEO Pharma to monitor whether RPA development is following their overall strategy. Additionally, as mentioned in the previous section, it also creates some challenges

regarding cross-organisational work as much specific knowledge will be located in each department.

Even though they have tried to establish a COE in IT, they still do not operate as a unit involved in the decisions regarding prioritising automation projects. When Johnny was asked the question on who has the final decision on which projects to prioritise he answered: *"IT does that to some extent, but it is not more structured than right now I do not think anything will get overruled."*(LEO Pharma, Johnny, Appendix F). Nevertheless, in reality, it is Johnny himself who is responsible for giving the green light for any projects in HR. He is the process owner of every process in HR, which leads any automation idea to his desk as the final step before starting the development. This raises the question whether this is the right level to solely approve such projects in HR. Especially in the future when their backlog of RPA projects have become larger and with more complex processes. This approach might have worked so far, as their prioritisation has been looser and the goal not necessarily has been to automate the processes with the most considerable benefits, but in the future, it might be beneficial to follow a more prescriptive model. As mentioned in Chapter 2 a descriptive approach can potentially lead to irrational decisions when individuals are merely discussing different decision alternatives, as they tend to put an unreasonable emphasis on the risk of the decision. If HR in LEO Pharma does not put more focus on a framework with more quantitative data, it could potentially be very harmful in their decision-making when they er presented with a more considerable backlog of processes in the future.

> *"I would say the tool is no more accurate than if I am going to announce a process saving, and then I have to asses whether the savings are 10 or 20 hours and no one is asking questions if I choose 10 or 20, so if I want it pushed through, I might say 20 or 25 hours instead."*
> (LEO Pharma, Johnny, Appendix F)

The quote above shows how their current assessment tool is not precise enough to be an optimal assistant in their decision making. The responsibility is still on the individual who can manipulate the tool as they want. This significantly increases the risk of irrational decisions when presented with multiple different alternatives.

An attempt to use a more prescriptive model is seen in R&D, where they rely on their excel document to organise and prioritise their projects, based on a mathematical calculation. A similar approach would be recommended in HR, especially when they are further in their RPA journey. Even a more centralised

model, where every department had their projects rated in the same framework, could create some benefits. The transparency alone could help to share some of the specific knowledge individuals are obtaining.

When interviewing the developer in HR, he highlighted some occasions where political pressure had affected the decision making when prioritising automation projects.

Table 5.1 shows an overview of the challenges dissevered at LEO Pharma throughout the last three sections.

Automation Criteria	- Faulty assesment tool - Non quantifiable criteria
Governance	- Lacking control and transparency - Not aligned with company strategy - Lacking focus from management - Time to deploy
Decision Structure	- Highly decentralised

TABLE 5.1: Overview of LEO Pharma Analysis

5.3 Skatteforvaltningen

5.3.1 Automation-prioritisation criteria

As also mentioned in the analysis on LEO Pharma, Section 2 described some criteria that made a process suitable for automation, that most organisations should be aware of. In the case description of Skatteforvaltningen, it was mentioned that several different departments prioritise their projects and our interviews have discovered that in the estimation committee and DigiPof, they do not necessarily look at the same parameters when automating a process. Of course, they have different responsibilities in DigiPof and in the estimation committee, but in this section, we will examine their prioritisation criteria compared to the theories from section 2.

Representatives from Data and Analysis sit in the estimation committee and estimate all projects coming in from STS. In this committee, they estimate the total cost of Data and Analysis resources to accomplish a task. When Carsten was

asked whether it is the agencies themselves that estimate their benefit from having an assignment automated, he answers.

> *" We can also sit at the Estimates Committee meetings and say 'It doesn't look like a big enough task', and then we bring it back as feedback, but we still estimate how many resources we should spend on it. It doesn't matter if we have to make it or not, it determines the priority board."*
> (Skatteforvaltningen, Carsten, Appendix B)

In the estimation committee, they only assess the costs in resources to develop the projects, but in DigiPof, both the benefits and costs of automating the process are assessed. At DigiPof, they have created a priority model in which the person submitting projects must fill in numbers and estimations that fits the process. Not everyone can submit projects at DigiPof, as they must have a professional level within the subject area that the process supports. This implies that only technically competent persons can submit projects to DigiPof, which means that the knowledge of the process is high, and thus DigiPof ensures that the estimates that are reported are more plausible since they are experts in the process. (Skatteforvaltningen, Richo, Appendix C). By having experts submitting projects for automation, DigiPof ensures that the processes Skattestyrelsen wants to be automated, are processes that are also suitable for automation.

> *" but whether it makes sense to make a robot here? They know a lot about that."*
> (Skatteforvaltningen, Richo, Appendix C)

When DigiPof estimates and assesses Skattestyrelsen's automation projects, they use quantifiable criteria to assess the order of Skattestyrelsen's automation projects. This means that there is a lack of estimates based on qualitative criteria, meaning that there are important criteria that are not calculated in DigiPof's estimation model. Furthermore, the quantifiable estimation model is used for all automation projects. This implies that the same model is used for RPA projects, Machine learning projects and BPM projects. These technologies are all different, so they should also be evaluated separately as each technology has different automation criteria.

When the process experts decide whether the process should be automated for RPA, they follow some guidelines that fit the theory. On DigiPof's estimation sheet, which procsesses experts must fill in, there are common criteria from Fung (2014) and Slaby (2012) theory of automation criteria that fits their estimation

model. The theory mentions that there must be a high volume of tasks that must be performed before automation is appropriate. DigiPof has the same focus, where the process experts evaluate the process, and if it has a high volume of tasks, then the process is scored accordingly. Since one must have a good knowledge of the process in order to be able to assess whether the process has a high volume of tasks, it is fundamental that a process expert assesses this.

Furthermore, DigiPof also focuses on the processes having recognisable patterns as well as manual and repetitive processes. These criteria are crucial to whether a process can be automated or not. It is also imperative for both DigiPof and the theory that the processes are routine. This is backed up by (Asatiani & Penttinen, 2016) 's model, which shows that the more a process is routine and at the same time performed manually, the higher the automation potential.

Because DigiPof uses an estimation model in which every process that Skattestyrelsen would like to automate is estimated and scored, DigiPof ensures that the optimal processes are automated almost every time. There are exceptions to less optimal projects being chosen ahead of more optimal projects. Richo says:

> *" There have been challenges in the past that the most proficient agencies are getting their things made first, but it is probably still the same that some agencies can push the others because they have some more things to automate."*
> (Skatteforvaltningen, Richo, Appendix C)

This can have a negative effect on how the projects are prioritised because, from a theoretical point of view, it must be the most optimal process to be automated, and not a less good process, just because a professional director shouts the highest.

When the estimation committee assesses the time spent on the automation projects, they do it with great expertise. Carsten, who is RPA Lead developer, has for many years worked with RPA, and he has a great understanding of how long projects take to develop, why he is a member of the estimation committee for the process automation department. When a task comes in, Carsten describes his role as

> *" I have a seat in the estimation committee, so when task requests come in from the individual agencies that are under Skatteforvaltningen then the tasks will be screened at the Estimation Committee meetings, and then we*

> *evaluate whether it is a robot task that I am looking at, or another task, so it's the other offices that should estimate it, and then we go back and look at the assignment, and look at how long it will take for us to make the solution."*
> (Skatteforvaltningen, Carsten, Appendix B)

When Carsten and the estimation committee receive the automation process tasks from the agencies, they only evaluate the cost of resources spent on developing the robots and not the future benefits of the robots. When Carsten estimates the development time of a robot, he uses some parameters when estimating the time spent. One of the most important parameters is the reusability of building blocks used to develop the robots. If the automation department already has developed a building block to access a particular system, then they can use the same building block for the new robot. This is an important parameter for estimating the total development time of a robot.

When the estimation committee and the responsible estimators for each agency to assess the processes, there is a certain factor that makes the process a high priority. As Skatteforvaltningen is a public organisation, they must comply with Danish law, which means that if there is a change in Danish law and the change affects a process in Skatteforvaltningen, then this process must be given the highest priority. This means that if Motorstyrelsen has two automation tasks in progress at the process automation department and the new law determines that one of their processes must be automated, then the new process begins and the other two are on standby. Tina from the automation department describes the regulatory priority as:

> *"If there are political priorities, there are some legal bindings, etc. It also makes it a priority."*
> (Skatteforvaltningen, Tina, Appendix A)

Furthermore, this indicates that legislation is an important parameter in the automation criteria of Skatteforvaltningen. This is because Skatteforvaltningen is a public organisation and is responsible for the entire population of Denmark and not private shareholders. Tina gives an example of a robot where it did not had the best business case, but because it is a political organisation and there is a lot of media attention, there are some robots that have to be made before others.

> *"...So while there are other things we would rather do but because it has political awareness, it comes first, even if it is not necessarily the best use of our resources."*
> (Skatteforvaltningen, Tina, Appendix A)

When an agency in Skatteforvaltningen wants to automate a process, it differs depending on which agency it is. Skattestyrelsen, which is the largest agency, has a department to prioritise which internal processes they want to automate. When prioritising their processes, they focus on both costs and benefits by automating the process. They also look at volume and whether the process has the appropriate criteria for automation. Furthermore, legislation is an important parameter for prioritising processes. When Skattestyrelsen's prioritisation department has prioritised their internal projects, then the development costs must be estimated by the estimating committee, which does not assess the benefits, but only assesses the resource costs of automating the process. Here, Carsten assesses whether the process is suitable for prioritisation and then whether the process automation department has building blocks that can be used to automate the process. If they have building blocks to automate a process, then Carsten estimates the process to take less time because the developers don't have to develop it all from scratch.

5.3.2 Robotic Governance

It is a long process in Skatteforvaltningen, from the idea of a robot's existence to the robot is used in production. It is because Skatteforvaltningen selects and prioritises the processes to be automated for robots four times a year. Tina says that this is one of the difficulties of the Skatteforvaltningen because it can take four months from the process owner wanting the robot to be chosen and this means that the process owner may have forgotten that the robot was needed. Some processes may also have changed while waiting for it to be prioritised, which means that the process owner has spent time preparing the enrollment for automation. Furthermore, automating a robot is a long process because it has to go through many joints.

> *"So everything depends on when you submit a task, it can take quite a while before it gets on the blackboard. And it's super unsatisfying regarding the collaboration you have to have with the agencies ..."*
> (Skatteforvaltningen, Tina, Appendix A)

This is backed up by Richo, who also describes the process as shaggy because it can take a long time from estimating the robot to the robot being developed. He further states that this is a management choice, and it is management who has chosen to prioritise new projects every quarter.

It is the management that has decided that Skatteforvaltningen should start developing robots, but almost everyone who was interviewed doesn't think the management has the right focus on the development of robots. If robots and general IT projects seek to have the greatest success, then the right focus throughout the organisation and especially from management is necessary, because they are the ones who need to invest further in it if it adds the right value to the organisation. Skatteforvaltningen is a large organisation, but for that, Tina thinks she has to struggle a lot with management to get new resources for the department, despite the process automation department are saving a lot FTE's every time they develop a robot, Tina says:

> *"When you think about how many FTE's we have saved and how big political cases we have helped with, I think we have to fight incredibly hard for every new resource we want."*
> (Skatteforvaltningen, Tina, Appendix A)

Tina further adds that she thinks they are at the bottom of the pile of upcoming projects from the management, despite being able to deliver good results. She believes that process automation provides much more value to the organisation compared to analytics, which does not solve a problem but becomes a higher priority than process automation. Besides, Tina also adds that her boss and herself spend much time making the management aware of the department so that it can get the right focus, but she does not believe that management is doing enough yet.

Tina elaborates that the reason why the management does not have enough focus on RPA and process automation is because of the culture and the management has an old mindset. Another reason may be that Skatteforvaltningen has experienced many crises over the last ten years, and since Skatteforvaltningen has chosen a problem-based approach and not an innovative approach to developing robots, it is clean-up work instead of finding new solutions and improve processes. Likewise, there is much focus from the whole of Denmark on Skatteforvaltningen, and often it is not automation projects that solve the crises that arise. If a new law is enacted, then some processes often have to change and do not need to be automated.

Carsten does not agree with Tina that the management has a lack of focus on process automation. He believes that the management finally has understood how much robots can give to the Skatteforvaltningen. The reason they disagree is that

Carsten does not have a managerial responsibility and does not often speak to management as Tina does.

Although there is a disagreement between Carsten and Tina whether there is enough focus from the management on robots, both Carsten, Tina, and Richo agree that the robots should create value for the Skatteforvaltningen. As described in section 2.4.2, the technology does not create value in itself; it is also the people and the business that helps create the value. The value can also only be measured when the technology is aligned with the business. In Skatteforvaltningen, the process automation department does not measure the true value of a robot. When an agency says that this robot can save several FTEs, then it is the agencies themselves who have the responsibility to measure the actual value. The only thing the process automation department is looking at is whether the robot is running and how many tasks it is performing. This means, the automation department can see the robot is performing some tasks, but whether it performs as many tasks as it was sold to do, they do not know.

The responsibility for measuring the value of a robot takes place in the respective agencies; likewise, do the agencies have their own strategies. As mentioned in section 2, the most important thing about IT governance is that the overall strategy is aligned with the IT strategy. When the process automation department develops a robot, they have no idea what the overall strategy of developing the robot is. They only know if they choose to ask for it.

At Skatteforvaltningen, there is an agreement that all agencies must have at least one process automated each quarter. This is a strategic decision by the management, which means that all agencies get something automated every quarter if they have some automation projects in their internal pipeline. This means that the process automation department must distribute its resources to all agencies. Tina is not happy with that distribution and thinks they can be more effective if they choose one or two agencies each quarter and focus on them.

> *"...and it would be nice if instead of being so strict about allocating everything evenly among each unit... then we prioritise that this chunk of task for* vuderingsstyrelsen *is being made and then it is two teams focused on those tasks, so we don't have to be working on seven different tasks from all the other units."*
> (Skatteforvaltningen, Tina, Appendix A)

5.3.3 Decision Structure and Framework

In Skatteforvaltningen, an automation request must be passed through many departments before the process is entirely automated. It is the process expert for each agency that prioritises the processes and decides in which order of priority the processes should be prioritised for each agency. They are responsible for prioritising the processes in the order that makes the best sense for the individual agency. The process experts work closely with the sub-director and the director when prioritising the processes. Each agency has its own tools for estimating the benefits and costs of each process, and that is why the process expert has a responsibility to make the right decisions.

Those who ultimately face the final decision on whether a process must be given high or a low priority is the priority committee. This Committee consists of sub-directors of each agency in Skatteforvaltningen and representatives of Cooperation and Transversal Governance. They prioritise based on estimates for each agency and estimations from the estimation committee. The Priority Committee meets every quarter to discuss which processes to automate. This indicates that the decision-making rights are centralised to a committee that tells the process automation department, which processes to automate and what priorities the various projects have. As mentioned earlier, legislation can affect the priority because Skatteforvaltningen is a public organisation linked to Danish law.

In DigiPof's estimation model, projects are evaluated based on criteria they have made themselves. This estimation model can be compared with the AHP model described in section 2.5.2. Meaning that their criteria have different weights, and when a process expert has to score their process, the person fills the criteria with numbers from one to ten. This ultimately gives a total score which gives a priority basis. As also described in section 2.5.2 about AHP, this model can be criticised for not taking political considerations into account, but with DigiPof, political legislation is an essential criterion for the overall estimation score. Furthermore, this model can only use quantifiable criteria, and not qualitative criteria, which might limit the value of the model.

Table 5.2 shows an overview of the challenges discovered from the analysis of Skatteforvaltningen.

Automation Criteria	- Non quantifiable criteria - Projects combined in one tool
Governance	- Disagreement on the necessary focus from management - Time to deploy
Decision Structure	- Highly centralised

TABLE 5.2: Overview of Skatteforvaltningen analysis

5.4 Summary and establishing necessity for improvement

As the previous analysis of LEO Pharma and Skatteforvaltningen have shown, there both areas were the organisations are similar and areas they are very different. Tabel 5.3 shows and an overview of some of the challenges.

	LEO Pharma	**Skatteforvaltningen**
Automation criteria	- Faulty assesment tool - Non quantifiable criteria	- Non quantifiable criteria - Projects combined in one tool
Governance	- Lacking control and transparancy - Not aligned with organisation strategy - Lacking focus from management - Time to deploy	- Disagreement on the necessary focus from management - Time to deploy
Decision structure	- Highly decentralised	- Highly centralised

TABLE 5.3: Overview of organisational challenges

One of the most significant differences between the cases is how the decision process is structured. Where LEO Pharma is very decentralised, as each department are developing and prioritising themselves, Skatteforvaltningen is rather centralised as they have one area doing all the development. In additional contrast, all the projects from each department are prioritised in the same pool. The centralised model at Skatteforvaltningen also showed a much more structured way of prioritising projects.

Multiple interviewees from both organisations indicated that there was a lack of awareness towards RPA from the management. They both felt that it decreased the potential of automation, as the limited resources allocated to the field restricted them in their daily work. When looking at automation criteria, many similarities are seen between the two organisations. Most of the similar criteria discovered are aligned with the theoretical foundation in chapter 2. However, the importance of some of the criteria was different. Where Skatteforvaltningen had legal regularities as a significant factor, LEO Pharma had GxP, which is specified in the pharmaceutical industry.

Both organisations had experienced some challenges with non-quantifiable criteria. Political aspects, among other things, can often affect how a project is prioritised, despite it not being the most beneficial ones.
How some of these challenges can be handled will be presented later on in this study.

Chapter 6

Artefact development

6.1 Introduction

During this chapter, we will present and develop the artefact. The artefact will be developed through three iterations. The three the iterations will move back and forth between the theoretical and the empirical evidence gathered to validate and understand the challenges.

The first cycle is characterised as a relevance cycle, in which we seek to understand the organisations and propose solutions in co-operation with them. During this chapter, we will interview the case organisations and design the system based on the evidence that has been gathered through the case analysis.

In the following cycle, we further seek validation and empirical evidence through interviews with the consultants as well as further empirical validation of the first artefact.

The final iteration seeks to gather the final feedback from the case organisations and test the validity of the computerised AHP prototype.

All iterations will build on our abductive methodology, in which we constantly move back and forth between empirical evidence and literature.

6.2 Design of first artefact

6.2.1 Introduction

During this section, we will build and introduce the first artefact. This chapter builds upon the foundation of the case analysis. As described in the previous section, this thesis will have a total of three iterations. During the first iteration, the essential points are to agree on the foundation of the artefacts, such as the rules governing meetings, transparency, governance, parameters and the structural mechanisms behind the artefact. To present the artefact during the future iterations, we have designed and build a prototype of the artefact. The prototype

has the appearances of a proper computerized decision support system. The reason for this is that we ensure the understanding of the artefact from the minds of the participating informants.

The section is structured in a way, that first, we will present the governance in the artefact and how the governance model imposes a transparent view of the processes across departments. Following this, we will introduce the decisional structures and how formal meeting-rules can help achieve coherence and broad support. Having introduced the fundamental governance and decision support structures, we will introduce the parameters that have been found during the first round of interviews as well as describe them and the reason for including them. Finally, we will present the artefact build on CDSS and AHP that ties together these principles through a prototype.

6.2.2 Governance and Transparency

When designing the first artefact, one of the main focuses was attempting to solve some of the challenges analysed in Chapter 5. A challenge both LEO Pharma and Skatteforvaltningen experienced was a lack of transparency on which automation projects each department was currently working on and had been working on. This had specifically caused problems in LEO Pharma, where multiple departments had started identical projects without any communication. Discovering this late in the process of developing the robot wasted much time that could have been spent on other processes or areas. Even though Skatteforvaltningen did not experience as severe difficulties on this matter, they still expressed concern regarding transparency. (Skatteforvaltningen, Tina, Appendix A)
Since each subject area is responsible for submitting the processes they deem suitable for automation, the lack of transparency is decreasing the quality of ideas being submitted. Mainly because the subject areas do not have the ability to get inspiration from each other and also since there is a risk that the departments are submitting similar processes that could have been combined in the initial phase. The challenge will result in a misuse of time for the leadership as they will have to spend time understanding the ideas of other departments that might be similar or achieve the same goal. Moreover, departments are not able to be inspired by other departments, as they are only able to view projects in their own silo. Some benefits are, therefore prohibited by having reduced transparency.

The initial focus, when designing the first artefact, was to create a framework that could optimise the transparency. Therefore removing some of the challenges that have been identified, by a lack of transparency. The framework should include projects across the entire organisation. Each department can then see what others have submitted and seek inspiration and consciousness from their ideas. This should also reduce the risk of different departments developing similar robots at the same time as they will at least be aware of what is being worked on in the other areas, even if they are not necessarily working together on the project.

The new framework is based in a Computerised Decision Support System, which will allow all departments to get full read-rights to all other projects that have been submitted across the organisation. They will be able to both identify projects that have been submitted previously as well as the current top-ranking projects, to understand how a qualified project should be submitted.

They are able to see these top-ranking projects, because of the AHP framework in which all projects are scored on the same parameters by the same weights. This allows for a more quantifiable and fair measurement and selection of processes.

Some important factors in the selection process, such as 'Reusability', will also become even more valuable as this framework will create an even stronger foundation for reusing different modules or snippets. The departments will not only have the ability to gather inspiration from other departments projects, but also the ability to identify similarities in automation projects where elements can be reused, which can make their time to deploy even faster. *Reusable Modules* as a criterion will be presented further in Section 6.2.4.

When organisations have built their process description and workflows on frameworks such as ITIL, we must expect that the processes have been documented thoroughly. Some of the informants have expressed that some of the documentation is not up to the standards that would be expected. (Skatteforvaltningen, Carsten, Appendix B)

Therefore a part of the implementation of our framework is that organisations should align each of the process descriptions, to the current flow. That is often an issue that has also been seen in implementations of ITIL. By ensuring that the process description has been updated, we are minimising the risk of errors and enhance our abilities to estimate the benefits of a process accurately.

Another focus in the design was to integrate a measure of how well the project was aligned with the overall strategy in the organisation. The literature on IT governance states this as one of the key factors to realise the benefits of an IT project. Furthermore, the analysis showed that several informants from both organisations stated that aligning the projects with the overall strategy was not something that they had given enough focus at this point in their RPA life cycle. Johnny explicitly stated that this should be something with a higher priority in the future.

> *"I think the next step will show RPA being a strategic priority where a more centralised approach is adopted, which includes more centralised governance and a higher connection to LEO Pharma's strategy."*
> (LEO Pharma, Johnny, Appendix F)

As shown in table 5.3, both LEO Pharma and Skatteforvaltningen have a lack of awareness on RPA from the management. According to the literature, this is also a significant factor in realising successful and beneficial IT projects and something that can be very harmful if the right level is not obtained. This is a factor that can be difficult to implement in a framework like this since gaining the trust from the higher-level management is something that will evolve over time if the technology shows good results. However, integrating the overall vision of the organisation in the prioritisation is something that can contribute by showing that RPA development is aligned with the companies best interests. Multiple theoretical grounded frameworks, such as the ROBIS framework that are built to assist in generating value from IT Projects, do agree that there is a need for a strategical foundation in the organisation, as there should be agreement on, e.g. to use the technology for either innovation or to enhance current processes.

Therefore it can be a factor in how well and how quickly the management will become aware of the potential of the technology. This is especially important in LEO Pharma since they are allocating very limited resources to RPA in most of their departments. This level of resources is significantly decreasing their potential in realising the benefits of RPA.

> *"For the other areas, I don't think that they have this level yet, because the management is not there. For example, in HR, Jesper, I mean he is a student, and they put all the responsibility on a student, which I don't see sense in doing. There should be more people."*
> (LEO Pharma, Jens, Appendix G)

Organisational Vision as prioritisation criteria will also be presented further in Section 6.2.4, among other important criteria.

6.2.3 Decision structures and formal meetings

As mentioned in Section 2.5.1 in Chapter 2, successful organisations perform decisions faster than their peers, better decisions and implement more of their decisions into the organisation. One of the challenges discovered in both LEO Pharma and Skatteforvaltningen was the time to deploy. One of the goals of this artefact is to create a better flow in the decision process by reducing the number of steps each project has to go through before the project is prioritised and the development can begin.

One of the critical elements in a framework like this is the degree of decentralisation it should contain. This framework proposes a hybrid between a centralised and a decentralised tool. The decentralised part is represented in the roles; Leader, Process Consultant, Developer and Quality and Risk employee. These four roles are predefined in the framework as the empirical analysis as well as the theoretical foundation showed that the presence of these roles creates the best results. However, the organisation can create its own additional relevant roles which add the potential of an even higher degree of decentralisation. Adding the right roles and assigning the appropriate people to these roles is crucial since it allows using the local and tacit knowledge most effectively. Furthermore, decentralising some of the decision rights to employees in the local areas gives those employees a sense of empowerment which will make them more motivated to work on the task with less risk of shirking and fewer mistakes. Table 6.1 illustrates how the respondent's title is translated to the roles in the artefact.

Name	**Original Title**	**Artefact Title**
Jesper	RPA Specialist	Developer
Manos	Director of Process and Technology	Process Consultant
Johnny	HR Director	Leader
Jens	Process Guru	Process Consultant
Tina	Chief Consultant of the automation Department	Leader
Carsten	RPA Specialist and Lead developer	Developer
Murssal	Employee in DigiPof	Process Consultant
Richo	Employee in DigiPof	Process Consultant

TABLE 6.1: Artefact titles of respondents

Moreover, the rating of the project will be of higher quality, by delegating the work to the employees that are experts in each of their areas. By decentralising the work, some of the employees might free-ride more, and allow for the other raters to do their work. The solution to this is to grant specific parameters only to be rated by certain roles, thereby using their expertise where it matters and reducing free-riding, as they are the only people capable of rating the project on their selection of parameters. By not allowing the raters to interfere with each others areas, we also stop coalitions from being formed, as this might pressure some of the employees into changing their ratings due to a coalition pressure.

Several employees with expertise in certain areas have felt that some projects have been pushed on to them and that their expertise had not been heard. Two examples of this are Carsten from Skatteforvaltningen and Jesper from LEO Pharma.

> *" ... We started tasks that I strongly argued against because, at that time, we simply weren't mature enough. ... but there had been taken some strategic decisions because they wanted us to show our worth."*
> (Skatteforvaltningen, Carsten, Appendix B)

> *"Sometimes there's a tendency to think that all processes can be automated, and that was also what was thought about this. There might have been a better solution, so the robot didn't take two hours to complete."*
> (LEO Pharma, Jesper, Appendix D)

By implementing the new framework, such decisions cannot be pushed on to the employees, as they will have to be heard during the grading of their parameters.

The framework also consists of a centralised part as LEO Pharma especially stated that there was a need for a more centralised model in the future. Furthermore, the theory substantiates this as there is a need for authority and a more centralised governing body with a mandate to supervise, monitor and ultimately challenge the decisions by other hierarchical members. This is also aligned with the theory on change-advisory board, where the board has the responsibility of the prioritisation.

In this framework, this authority is represented as the Evaluation-committee, which should consist of representatives from each business unit. These representatives should be leaders or managers from each of the areas to ensure that the final result is something that everyone will be satisfied with. As the literature on the change-advisory board states, such meetings should include representatives directly involved in RPA but also employees from the business who

work with the processes daily. By having the managers from each unit attend the meeting, we ensure that every interest is being considered. As also stated in relevant literature, the representatives should have the mandate to challenge the decisions made by the committee based on the framework. However, the framework proposes that the scoring of each project is final and can not be changed. The assumption is that after each expert has scored the project based on their estimates, there is no way to gain a more precise estimate. If the representatives were to change the score, it would, therefore, contradict the initial attempt to use the local knowledge most effectively.

The way the committee can challenge the decisions is, therefore, which project should be prioritised and not how they should be scored. It is essential that the committee convenes often and revisits the current projects that have been worked on, as value often arises when members can think about the inputs from the experts and combine it with their own specialised knowledge. This opens up for bargaining and arguing to reach a quorum on which processes to automate.

It is clear, that as this arena is a political arena, the members of the Evaluation-committee must accept and adhere to the data that has been given to them through the system so that the evaluations are not fully ignored. With that said, it is essential to gather the support of the entire organisations, and therefore to politically act in specific ways, so support is being given to the preservation of RPA efforts. It is the job of the Evaluation-committee to balance between the data and the political pressures.

Due to the often recurring bi-weekly meetings of the Evaluation-committee, they should also have the mandate to challenge the data that has been sent to them, as some of the members of the Evaluation-committee might have extensive knowledge about a particular process. The Evaluation-committee must not be abusing their powers to coerce the experts into re-scoring the project to the Evaluation-committee's liking.

6.2.4 Criteria for prioritisation

In this section, the criteria for the prioritisation model will be discussed and explained in relation to the literature mentioned in section 2 and the collected empirical data from the interviews gathered during the first iteration. In Table 6.1, a matrix has been made to show how the criteria are related to the empirical data and theory. In the column on the left, the criteria are listed. These criteria

have been carefully selected after lengthy discussions about which parameters to include. The criteria are based on what respondents consider important when prioritising RPA projects and what the theory says is relevant in prioritising automation projects.

Reusable modules

Reusable Modules cover the building blocks previously used to develop robots. When a robot is developed, some standard components can be used for multiple robots. This means that the module only needs to be developed once, after which the same module can be used for other robots. For example, a *Reusable Module* may be an integration with a particular system, or a standard component, used in the same way each time. This parameter is mentioned both in theory and in our interviews with both Carsten, Tina and Jesper.

Reusing building blocks will make the development more comfortable and reduce time in completing the robot. Therefore, the reusability of modules represents a primary parameter when calculating the total development time of a project.

Generally, a developer will evaluate this parameter because the developer has an overview of the existing building blocks and what building blocks that can be used for the automation task. A developer will, therefore, have the most suitable competencies to assess the number of building blocks to use. This parameter must be weighted on a scale from one to ten. A high score implicates that many modules can be reused to build the robot.

Workload

The *Workload* is a measure of the time to build the robot. The *Workload* is considered the amount of time one or more developers spend developing the robot. Development time is a crucial factor in development projects, as both Skatteforvaltningen and LEO Pharma have limited development resources. If there is a significant workload for a project, it means that either LEO Pharma or Skatteforvaltningen must limit their projects because it is essential to have their resources in mind. In the *Workload* parameter, we seek to understand the amount of hours needed for a developer. This suggests that the person assessing this parameter should not take into account either the number of clicks in the process or the time spent in the process since these criteria have their own parameters.

Both Jesper, Carsten and Tina mentioned this parameter in the first iteration interviews, and all felt that this was of great importance for prioritising automation projects. Generally, a developer will evaluate this parameter because the developer has an overview of the developing time. This parameter must be weighted from a scale of one to ten. A low score means that there is a low workload and the task can be solved quickly and if a developer gives a project two then it takes half as long to develop as a project with a score of four.

Process maturity

Process Maturity indicates how mature and stable a process is in its current design, before automation. This parameter is necessary because both Skatteforvaltningen and LEO Pharma consider this parameter important. Likewise, the theory states that not all processes can be automated and processes must have a level of maturity before it should be automated. By maturity is meant that the process has some fixed rules and is standardised. It is repetitive tasks it performs, and they are repeated many times. If a process needs to be changed within 18 months, the process is not considered mature. At LEO Pharma, they desire to optimise and mature processes before being automated, so they avoid automating a process that needs to develop within 18 months.

> *"So before I can automate a process, at least in our current state, there must be a maturation process where we get a stable structure..."*
> (LEO Pharma, Jesper, Appendix D)

This parameter must be weighted from a scale of one to ten, where one suggests the process is not mature and ten symbolises the process is mature. The person assessing this parameter must have a good knowledge of the process.

Internal prioritisation

Internal Prioritisation is a measure of how much the specific local business unit would like this project to be automated. In both Skatteforvaltningen and LEO Pharma, the demand for automation projects is higher than the supply. This means that both organisations have more projects that can be automated than they have resources to develop robots. In both organisations, many business units have more projects they want to automate, and this parameter allows the individual business units to assess how important the project is to the department's strategy and vision.

In their current structure in the prioritisation process of both Skatteforvaltningen and LEO Pharma, they have limited options to quantify the qualitative parameters that also influence their internal priorities. An example might be a department would rather automate a process because an employee is retiring soon, but there is another process that scores better in their current prioritisation framework. The *Internal Prioritisation* parameter allows the departments to prioritise their projects internally with their business unit strategy. It will often be a leader who evaluates this parameter, and it is rated from one to ten, with ten being the highest priority.

Risk evaluation

The *Risk Evaluation* parameter covers two things. The first is the chance of an error happening, and the second is the cost of that error if it were to happen. When developing an automation project, there is a risk that the project will fail and the critical error must be taken into consideration. Not all processes can be performed entirely automatically, and therefore some parts of the process must be performed manually. This parameter should evaluate how critical the errors can be and how much manual work should be done if an error occurs. The risk of a failure must be assessed by a risk and quality employee as they know the risks involved in the processes. This parameter must be rated on a scale of one to ten, where a score of six is twice as likely to fail than a score of three.

Organisational vision

The *Organisational Vision* is a measure of how the project is in line with the overall vision of the organisation. This parameter should not be mixed with *Internal Prioritisation* since this parameter includes the entire organisation's vision and not the vision and strategy of each business unit. The theory asserts that if an IT project aspires to succeed, it is significant that the overall vision of the organisation is aligned with the IT project's vision. If the two visions are misaligned, the project will not receive the maximum benefit. By this parameter, the vision of the project must be assessed with the overall vision of the organisation, and it is often a leader or a decision-maker who must evaluate this. Both Skatteforvaltningen and LEO Pharma mention this parameter as necessary, and both organisations try to evaluate this parameter.

> *"Right now, a new strategy regarding digital Skatteforvaltning is under preparation and how we as a board can support the entire Skatteforvaltning*

> *in becoming more digital and data-driven."*
> (Skatteforvaltningen, Tina, Appendix A)

For the automation project to receive the right support from the management, the project must be aligned with the overall strategy of the organisation, and both with Skatteforvaltningen and LEO Pharma, they think there is a lack of attention from the management. This parameter can help receive more focus from top management on automation projects. It is overall one of the key aspects of IT governance. This parameter must be evaluated on a scale of one to ten, where an automation project with a score of ten has a perfectly aligned vision with the organisation's overall vision.

System count

The *System Count* is a measure of how many systems the robot access in the process. This parameter must be evaluated by a developer or a process consultant as they know when a system is technically switching from one system to another. Furthermore, a process consultant knows the process, and therefore this person can evaluate this parameter. A developer needs to know how many systems the process contains, as integrations must be made each time a new system is used in the process.

Both Jesper, Jens and Carsten mentioned this parameter in the first iteration interviews. They all mentioned how it is important for a developer to know how many systems the process contains. Although the developer knows that building blocks exist for some of the systems in the process, this should not affect the assessment of this parameter, as this parameter must state how many different systems the process contains. This parameter must be evaluated from a scale of one to ten, and ten indicates that there are many systems in the process, and one suggests there are few systems.

System complexity

The *System Complexity* is a measure of how complex it is to access the systems and use them. Some systems might be more complex than others. The current robots at both Skatteforvaltningen and LEO Pharma use several systems, and not all systems are easy to access. In order for a robot to access a system, an integration must be made from the robot to the system. Some systems are more complex than others, so it demands more development time to build integrations from the system to the robot. This parameter needs to be evaluated by a

developer because they have knowledge of the back-end, which is used to make the integrations. The developer must assess whether the systems are complex to access and whether the systems' back end and database have the structure to be automated. This parameter is evaluated from a scale of one to ten, with ten being very complex and one being slightly complicated.

Documentation quality

The *Documentation Quality* parameter covers the reliability and validity of the current process documentation. The process documentation is used by the developers to understand the current process. Therefore, the process documentation must be understandable and of appropriate quality. If the quality of the process documentation is low, errors can occur when the developer starts developing the robot since the process is not adequately described. When this parameter must be evaluated, it is the quality and risk employee who evaluates the quality of the process. The quality and risk employee must evaluate the current *Documentation Quality* of the process and thus score it on a scale from one to ten. If it scores ten, then it has an excellent *Documentation Quality*, and if it scores one, it has a low *Documentation Quality*.

Both Skatteforvaltningen and LEO Pharma mentioned the quality of documentation as an essential parameter in the first iteration interviews. Both organisations are aware of the quality of the documentation, and at LEO Pharma, the quality of the documentation must be high because they work in the pharmaceutical industry where there are high requirements for documentation. The theory also states that it is essential with a high quality of documentation on the automated processes, why this is an essential parameter in the framework.

Clicks and interactions

Clicks and Interactions measure the estimated clicks and data extraction interactions to be done throughout the flow. This parameter intends to show the developers how many clicks and interactions the process possesses. The parameter indicates how complicated the process is since a developer requires to know how long and complicated the process is for automation. The more clicks and interactions a process has, the more times the robot has to handle errors, why a developer must know how many clicks and interactions the process contains.

Both the theory, LEO Pharma and Skatteforvaltningen cite the number of *Clicks*

and Interactions as essential parameters when automating a process. The theory states that before a process can be automated, it must contain many interactions while being rule-based.

Both Skatteforvaltningen and LEO Pharma state that the number of clicks and interactions are an essential part of their preparation when selecting automation projects. When evaluating this parameter, it is the developer or process consultant who must evaluate this. This parameter must be rated from a scale of one to ten, where a score of six has twice as many clicks and interactions as a score of three.

Legislation pressure

All the respondents in the first iteration interviews cited legislation as a parameter that is important when automating a process. All respondents at LEO Pharma mentioned GxP as a vital part of their priority when automating a process, and at Skatteforvaltningen, all respondents mentioned that Danish legislation was an essential parameter for which process they wanted to automate. At DigiPof in Skattestyrelsen, none of their projects scores below 4.9 in their current internal priority system if the process contains legislation.

> *"If they have agreed to legislation, then it scores at least 4.9 no matter what they have answered down through."*
> (Skatteforvaltningen, Richo, Appendix C)

As also mentioned in the case analysis for both Skatteforvaltningen and LEO Pharma, they currently have much focus on legislating, and this is an important parameter when choosing processes for automation.

This parameter should be assessed by either a leader, a process consultant or a risk employee. The person assessing this parameter must know the legislation why all three employees can judge this. This parameter is rated from a scale of one to ten, with ten as a process with high legislation, and one with non-existing legislation associated with the process.

Customer satisfaction

When automating a process, merely looking at the departments own need in case of savings and managers preferences is not enough. RPA can also be used to ensure a higher satisfaction from your customers. Customers can be seen both as the organisations internal customer, and the external customers.

For the internal customers, RPA might be able to generate a new report on GDPR risks that is being sent around the organisation, which is a new and added capability that will make the customers of the department more satisfied.

For the external customer, RPA might be able to cut some time off the yearly tax-calculations, which makes the population more satisfied.

Time usage

Time Usage is a measure of the current time used for a regular employee to complete the task. This should not be confused with a developer to develop the robot or how many transactions the process contains. This parameter assesses how long the process takes in hours, minutes and seconds, from the time an employee starts working on the task to the end of the task. This should be used to determine how much time a robot can save the organisation. It is significant for an organisation to know the time usage of the process, as this is an essential parameter in theory, in Skatteforvaltningen and LEO Pharma.

The longer the process takes, the more time the organisation can save by getting a robot to do the work instead of an employee. A process consultant must evaluate this parameter as they know the process the best, and they know the time used for an employee to complete the task. This parameter is not rated from a scale of 1 to 10, but with the current time used for a process to complete in minutes.

Amount of transactions

The *Amount of Transactions* is a count of how many transactions being finished each month. It is crucial for both Skatteforvaltningen and LEO Pharma, to understand how many transactions the process contains every month, to determine whether the process is advantageous to automate. This parameter is used together with the *Time Usage*, to calculate the total FTE's saved for the process.

An essential criterion in the theory of automation criteria is the number of transactions in the process. The theory asserts that the process must contain numerous transactions, and this is also an essential parameter for both Skatteforvaltningen and LEO Pharma. This parameter is not rated on a scale from 1 to 10, but with the amount of transaction, the process finishes every month.

Summary

Please see Table 6.2 for an overview of the parameters that have been discovered during this development phase, as well as the involved theory and informants that have provided us with the necessary information.

In the table, all the informants with an X have provided us with the parameter.

		LEO Pharma				Skatteforvaltningen			
	Theory	**Jesper** Developer	**Manos** Process Consultant	**Johnny** Leader	**Jens** Process Consultant	**Tina** Leader	**Carsten** Leader	**Richo** Process Consultant	**Murssal** Process Consultant
Reuseable module	X	X				X	X		
Workload*		X				X	X		X
Process maturity	X	X			X	X	X		
Internal prioritisation				X	X	X		X	X
Risk-evaluation*		X	X	X	X		X	X	X
Organisational vision	X		X	X		X			
System-count*		X			X		X		
System complexity*	X	X			X		X	X	X
Documentation quality		X	X				X	X	X
Clicks and interactions*	X	X					X		
Legislation pressure		X	X	X	X	X	X	X	X
Customer satisfaction			X			X		X	X
Time usage	X	X			X	X	X	X	X
Amount of transactions	X	X	X		X		X	X	

TABLE 6.2: Parameters discovered from literature and interviews

Parameters marked with * has en inverse relationship on the prioritisation

6.2.5 Artefact prototype

In the previous section, different parameters have been discussed. During this chapter, we will showcase the prototype and elaborate on the implementation of these parameters into a computerised decision support system, based on principles from the AHP-based framework decision system. In short, we will call our system **CDSS for RPA** Moreover, this section will primarily address the design of the artefact itself.

By combining CDSS with AHP, we are able to use a computer-based system that can handle large amounts of data(CDSS), with a very organised and structured decision system(AHP).

When pipelines or backlogs are growing in size, organisations often lose track of what they see as the non-significant projects at hand and therefore have difficulties tracking them down if they one day become relevant again. Moreover, some projects get pushed to just outside the relevance barrier and are therefore not acknowledged anymore. This is an issue that is visible at Skatteforvaltningen, as they are only looking at the top 20 projects.

> *"Do we have capacity for these top 20 lists that Skattestyrelsen have sent us?"*
> (Skatteforvaltningen, Richo, Appendix C)

A solution to this issue is to create a transparent and visible system, that can show all opportunities in the organisation and across business units. The business might still discuss the primarily top 20 projects, but they have the visibility of all projects in the pipeline. By building such a prescriptive decision system, for the scope of this thesis we will assume a rather rational thinking as well as rationality being enabled by communication. An issue in the implementation of this system is that there will be free-riders during several phases of the decision process that will leave out the potentially necessary information for a correct scoring on the parameters. However, both Skatteforvaltningen and LEO Pharma have systems that could be seen as a CDSS combined with AHP, but multiple issues have been found in their implementations as described in previous chapters.

Of relevance for this section, are the below highlighted issues.

- Projects combined in one tool
- Lacking control and transparency

Having briefly summarised the issues in the current implementation of CDSS and AHP in Skatteforvaltningen and LEO Pharma, we have developed the CDSS for RPA system to present all the parameters that we have identified in the previous chapter. The artefact has not been designed to show the principles mentioned in the previous section that cannot be quantified into a parameter.

Moreover, the artefact is presenting the customisation of different roles. One of the issues that we highlighted in both Skatteforvaltningen and LEO Pharma was a lack of control and transparency across the different departments. To show and implement some of the principles that we have previously touched upon in this analysis chapter, we have decided to create roles, that are only able to rate certain criteria and therefore cannot interfere with the rating of things that they are not specialised in. We have done this to avoid political interference in decisions that a leadership role should not be able to touch. With that said, the system can be customised, and all parameters can be added to all roles, as situations such as the one seen in LEO Pharma demands entirely different parameter constellations than the ones needed at Skatteforvaltningen. We have four predefined roles in the system.

- Leader or other decision maker
- Process-consultant or opportunity finder
- Programmer or developer
- Quality and Risk employee

The roles have been found, as these are similar to the roles that we have met at Skatteforvaltningen and LEO Pharma, as well as the typical roles in the organisations that have been described in the relevant theory. Neither Skatteforvaltningen nor LEO Pharma has current Quality or Risk managers, but due to literature recommendations of having employees that are focused on risk, the role has been added to the list.

Moreover, the roles have matched the informants that we have been interviewing. We will further validate these roles during our interviews with the informants in the future iterations. The relevant literature does not structure RPA projects into specific predefined roles, and therefore we do have to validate this assumption during future iterations.

The system is also capable of assigning an individual to a specific department, therefore permitting the person only to rate the projects of that department. The

individual is still able to observe the projects from all departments. The rationale for this has been analysed previously in this chapter.

The role and actors systems are created as a 1:1, each person can only have one role, but the role to the parameter is created as an N:N, so that one role can have multiple parameters assigned to it and one parameter can be assigned to multiple different roles. This decision has been taken, as organisational layoffs and illness could result in a person having some parameters assigned to them, that they, therefore, cannot rate. By assigning these parameters to other people, they are able to rate those as a backup. It is therefore also important to note that a person does not have to rate all of the parameters that they have been assigned.

The first version of the configuration-page can be seen on Figure 6.1.

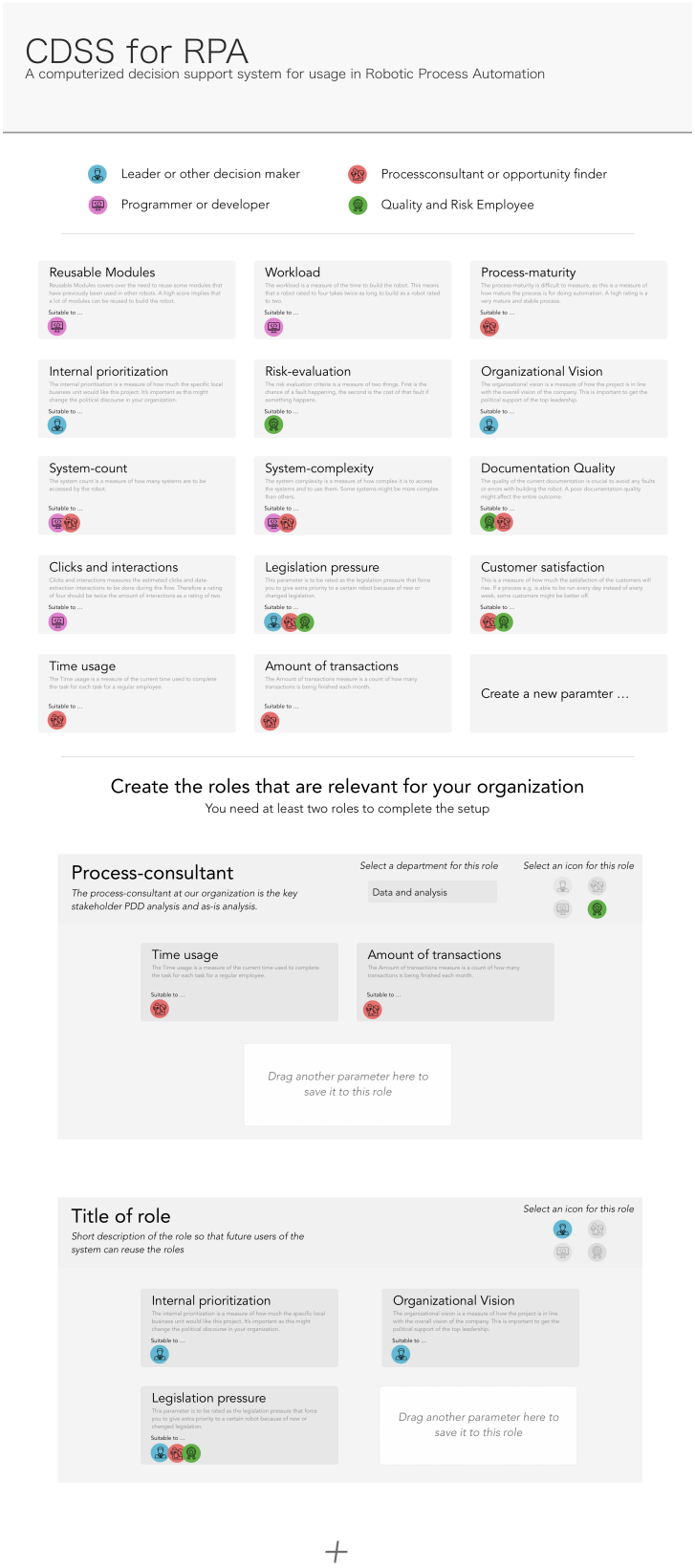


FIGURE 6.1: Parameters and roles, Artefact 1

Another critical aspect of the CDSS for RPA system is the rating of each parameter by the person. The rating will consist of a Likert scale of 1-10 for all the parameters, as this is the usual standard of AHP systems. The system does accept the possibility of creating a rating of up to 11 on some parameters, due to organisational change, but this has to be agreed upon by all relevant actors. The reason for allowing this is to counter problems where a project is rated 10 in complexity, but the following year, a bit more complex project is found that will, therefore, receive the same rating, even though the previous project would be more suitable for automation. As it is seen on Fig 6.2.

Moreover, by looking at Fig 6.2, one will notice the weighted score on the mock-up. The weights in the final model have not yet been found, as these will be based on the interviews with the informants during the interview round two and three as described in Chapter 3.

FIGURE 6.2: Individual rating page, Artefakt 1

During the formerly described prioritisation-board-meetings a simple overview of all processes and the grading should be view-able so decisions can be taken swiftly and effectively. In this artefact, the overview can be seen on Fig 6.3.

CDSS for RPA

A computerized decision support system for usage in Robotic Process Automation

Prioritizationboard

#	Project Title	Developer	Leader	Quality/Risk	Proccess	Total
1	Project Alpha	6.4	9.8	7.4	9.5	**9.1**
2	Project Beta	9.4	8.5	7.9	9.1	**8.7**
3	Project Charlie	7.1	8.1	8.8	8.9	**8.6**
4	Project Delta	9.4	9.2	7.4	7.8	**8.1**
5	Project Echo	6.9	8.1	7.8	7.5	**7.6**
6	Project Foxtrot	7.0	5.4	7.9	7.5	**7.4**
7	Project Golf	6.1	7.4	7.3	6.7	**6.8**
8	Project Hotel	8.3	3.2	2.4	5.4	**6.4**
9	Project India	9.8	5.9	7.0	6.2	**6.3**
10	Project Juliet	9.6	2.0	3.0	5.8	**6.1**
11	Project Kilo	3.9	4.3	6.5	6.7	**5.6**
12	Project Lima	2.1	3.6	6.6	6.8	**5.5**
13	Project Mike	4.9	5.0	4.7	5.4	**5.0**
14	Project November	1.0	9.0	4.1	4.6	**4.8**

FIGURE 6.3: Overview at prioritisation-board, Artefact 1

During the meeting, each of the projects can be scrutinised by clicking on the title. This will change the view to a representation of all the ratings that the project has received so that the members can see why the rating, e.g. *Organisational Vision*, have been quite low. It is important to note, that these are not editable by the members of the board and therefore the drag-able markers have turned grey.

The page will also contain a short description of the project as well as links to the process description and the document that was used in the submission of the project. The page can be seen on Fig 6.4.

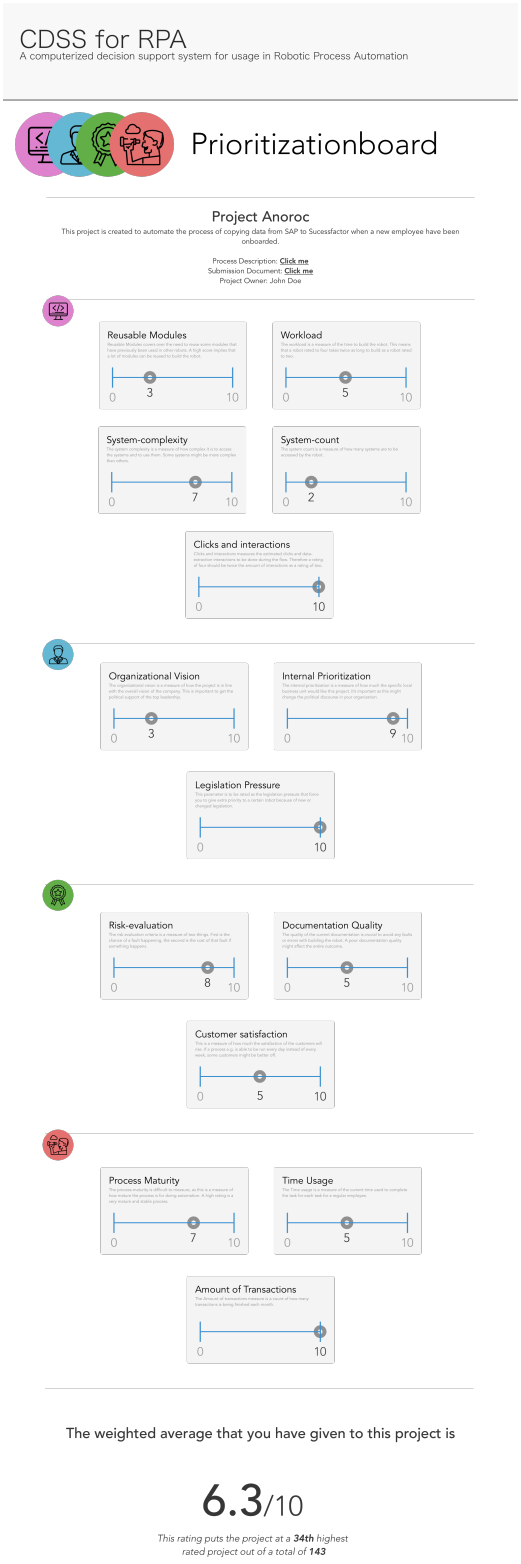


FIGURE 6.4: Overview of role ratings, Artefact 1

When a project is clicked on in the overall view, the individual ratings are shown to the meeting participants, but these are not editable.

6.2.6 Summary of first artefact

The first artefact was designed based on the theoretical foundation and the empirical findings. The main focus was to construct a framework that could solve some concerns regarding transparency, by having a system where the projects of each unit are collected, managed and prioritised. Four predefined roles were created; Leader, Process Consultant, Developer and Quality and Risk employee. These roles ensure an appropriate degree of decentralisation to ensure optimal use of the local expert knowledge. The centralised part of the framework is the evaluation-committee with the responsibility of controlling the prioritisation. Based on the theory from CAB, they should have meetings where they access the prioritisation and determine which projects should be initiated.

The first artefact includes 14 automation criteria which should be estimated by the relevant roles. Table 6.2 gives an overview of the criteria for the first artefact. The weight of each criterion for the final prioritisation has not been outlined in the first iteration, but will be displayed in the second and concluded in the final artefact.

6.3 Design of second artefact

6.3.1 Introduction

During this section, we will evaluate and further build on our artefact. As per our methodological framework rested in the Design Science method, we have completed the relevance cycle in the previous iteration, in which the informants gave us inputs on current challenges that they experienced. Moreover, we have compared their inputs and current structures with the theoretical framework, as described in the previous section.

During this section, we will build upon the artefact and complete a rigour cycle, in which we will further validate the artefact constructed on the input from our case organisations. During this iteration, we have been talking to Kristoffer Brodersen and Mikael Varle from KPMG Denmark. They are both employed as Senior Consultants and are RPA specialists, having completed multiple RPA projects at a broad range of Danish organisations.

During this cycle, we will validate our framework on the governance and decisional structural side, to understand how they have completed successful projects and observed successful governance models previously. Moreover, we have asked them for validation of our ideas presented in the previous section on the formal meetings, committees, experts and the usage of the AHP framework. Following that, we will present the weights of the different parameters, that are important for the AHP framework to work. Finally, we will present the re-designed artefact, that considers the new empirical research.

6.3.2 Governance and Transparency

One of the crucial elements in our framework is the enhanced transparency, which is achieved by having a completely open prioritisation-system, in which all the different business units can inspect proposed projects from the other business units. As our system is built upon a model of Computerised Decision Support System with a foundation of AHP framework, it is simple to allow all the users of the system to see each other's opportunities and recent projects.

Through our interviews, we sought to understand a successful governance and transparency model further as well as validate or invalidate some of our initial ideas from the first design of the artefact. Our empirical evidence in this phase

showed that the constructed model is highly relevant and on the right track. The RPA Experts from KPMG currently used systems that reminded them of our system when rating processes in organisations, although they often used Excel instead. (KPMG, Mikael, Appendix H)

In the previous artefact iteration, we assumed that due to the broad usage of ITIL and other governance systems, the documentation conditions would be of quite a high quality, so that the experts that had been selected to score the different processes would be fairly capable of judging the process with a moderate degree of work. We now understand that this is a naive assessment of the current *Documentation Quality*.

> *"The current documentation quality is a bit, ehh... You always have to document things again, and I have never been a place where we haven't ended up doing that. Of course, it is possible to use the current process description to evaluate."*
> KPMG, Kristoffer, Appendix I

Based on this, we would have to allow more time for the process-consultant to go out and understand the current process, to ensure that the process is capable of being scored. Therefore we do also have to introduce a new formal meeting, that will be further described in Subsection 6.3.3.

The current artefact has been based quite a lot on quantitative numbers such as the current amount of work being done in the process, as well as the workload to complete before a new robot can take over for the current employee. However, another critical aspect is the importance of securing organisational likeability and satisfaction. We have included this in the first artefact, as that is in line with the theoretical groundwork that has been described in Chapter 2.
During this iteration, we noticed the informants had some degree of disagreement on the necessity of including these 'softer' parameters in the model.

> *"Let us say that you are in a compliance-department, then it is probably not important that they are saving FTE's, as you have probably budgeted to do that, but the most important thing is that the quality is good. I see great value in aligning the robot to the KPI and the vision for the department or the entire organisation, but that is also something that you have included in Customer Satisfaction."*
> KPMG, Mikael, Appendix H

> *"I do not think it [Organisational Vision] is important. I do not think that it [Organisational Vision] is something that should be used as a definitive fact for selecting processes in the organisation."*
> KPMG, Kristoffer, Appendix I

Due to the disagreement between our informants but the clear backing in the IT governance and decision structure literature, we included these parameters as well as the leading influence in the selection process. The main reason is that a higher degree of organisational alignment correlates with a high degree of support from the organisational leadership in continuing the automation process.

One of the advantages of our system is the added transparency. During the interviews, we examined the informant's view of the system, which confirmed that the full transparency between different business units and across the entire organisation would be highly beneficial for innovation and break-up of silos. We have therefore decided to keep the innovation in the system, but moreover created another screen in the system, in which the actors will be able to see previously finished projects, as a method to find inspiration.

> *"It will be able to create some inspiration for the others, where they might see something interesting and says 'Oh, I might be able to use this.' The most important thing is to create as much hype as possible, so if you see that someone made a cool robot somewhere. I believe that some of the worst things, is where you have some silos, where you are within the same organisation but in different departments, and then you are doing some RPA that is completely isolated. They are not sharing any information, and you are currently spending time-solving a task that someone completed five months ago somewhere else, so it is extremely important to knowledge-share, and this can create it."*
> KPMG, Mikael, Appendix H

This quote also supports our assertion that the current process in LEO Pharma in which every department is managing their RPA efforts can be harming for development, innovation and idea-generation, as they are not able to share knowledge with each other, but are instead in silos. This is further substantiated by our interviews with LEO Pharma, in which they were working on things that they further down the development phase, discovered that another department had already begun building. (LEO Pharma, Jesper, Appendix D)

Issues with implementation in public organisations

The literature on implementation of other generic models and systems demonstrates that there is often a lot more resistance and a more limited possibility of success when implementing in public organisations compared to private organisations. We are aware of these concerns and have, therefore, further investigated challenges regarding the implementation of our framework in the public sector.

> *"You could implement it, but you have to pay attention to the things in the system, if it should be all of the departments and a central CoE, which would be a good idea. (...) It's not more obvious in the private than the public."*
> KPMG, Kristoffer, Appendix I

> *"I believe that you should rate a process the same way[as the private organisations], but it is being run a bit differently, it's more centralised regarding the purchases and so forth."*
> KPMG, Mikael, Appendix H

Based on the above quotes from our informants, we will further pay attention to this in the next design phase, but for now, we have confirmed that there is still a high potential in implementing the framework in both public and private organisations, but that we do have to be aware of particular challenges according to the literature.

6.3.3 Decision Structures and formal meetings

During the first artefact, we introduced a decentralised scoring-model in which allowed the different experts to advice and score the different parameters of the robot. Moreover, we introduced a centralised governing body, the Evaluation-committee, whom will evaluate all the scored projects and as a result of the evaluation take the appropriate decisions as to whether the project should be started or not. The Evaluation-committee has been tasked with converging monthly, and according to Mikael, that is important for the system to succeed.

> *"(...)'Oh well, we didn't approve it this week, but we'll meet again in three months, and we can discuss it there.' Then you're losing the motivation from the different stakeholder, which is what characterises RPA."*
> KPMG, Mikael, Appendix H

Moreover, we have also seen support to build up a system in which the Evaluation-committee has the full power to take decisions on behalf of the RPA developers,

but in which they are not allowed to change the criteria, as it was set out in the previous artefact.

> *"There needs to be room for going in there and overwrite certain decision and say 'Now we are prioritising this because I say so, but it is good to indicate what should be prioritised."*
> KPMG, Kristoffer, Appendix I

This also solves some of the concerns by implementing AHP frameworks, as they are often restricted if some of the important aspects surrounding a process are not discovered during the scoring of a process, or if there have been some external changes that call for fast automation. This is also the reason that even though the system is built as a Computerised system, it is merely a support system to the actors who can take the final decision.

As described in Section 6.3.2, a new formal meeting should be introduced in the model, that is the Scoring-committee meetings, which should be held monthly, in which the process-consultant presents the different projects to all the experts that are relevant for scoring the project. The process-consultant will be able to consider any issues with the current process documentation as well as present new and clearer documentation as well as initiate the contact with every relevant stakeholder. This meeting allows for questions between the experts, as to further understand the different processes that have been scored. This gathering is also a community to exchange ideas and concerns for current or previous scoring. Coalitions must not form here, by, e.g. having multiple developers but only a single Quality and Risk employee, therefore trying to undermine arguments related to these factors. It is also essential to note that the scoring of the projects will not occur during these meetings, but will still happen independently.

Relevant literature clearly expressed the need for involvement from a Quality and Risk employee that would be able to have an opinion in the process. This crucial part of systems development such as RPA is understandably challenging for some people to support, as it is seen as a bureaucratic showstopper or is deemed unnecessary.

> *"Sometimes, that Quality and Risk employees are living in a fantasy world, and if they are responsible for a process, that they are often saying 'Oh no, if this process fails, the world is going to end."*
> KPMG, Kristoffer, Appendix I

Despite the negative sentiment towards Quality and Risk employees from both of the informants, we are keeping this role in the system, as the literature firmly support this decision. A solution to the issues stated by the informants would be only to use Quality and Risk employees that were not directly a part of the process, and instead, give a third-party view on the criticality of the process as well as the risks for the organisation if something were to fail. The Quality and Risk employees would all have to be aware of the benefits as well as challenges with RPA to make this distinction between processes. The transparency of our system, will also easily be able to reveal, if the Quality and Risk employees are frequently rating the risks as being high, therefore communicating with them to ensure that the rating is correct.

6.3.4 Weights of Parameters

A purpose of interviewing Mikael and Kristoffer was to evaluate our parameters with experts and to assess the importance of each parameter. We will examine whether all the parameters are equally important and should be equally weighted in the overall assessment of the projects. Kristoffer and Mikael assessed the importance of the individual parameters on a scale from one to ten, with ten being an essential parameter and one being a very insignificant parameter. Furthermore, the consultants justified their choice through comments and explanations. They also commented on which roles should evaluate each parameter in practice.

Reusable modules

When reviewing *Reusable Modules*, Kristoffer and Mikael disagreed about the importance of this parameter. They both agree this parameter should be included, but Mikael scores it as very important and gives it a score of 8, and Kristoffer scores it at 3.

> *"After all, it doesn't say anything about the difficulty of the process or how long it would take development - or a little - but not so much."*
> (KPMG, Kristoffer, Appendix I)

Kristoffer does not think this parameter tells us how long a process will take, and therefore he does not believe this parameter should be weighted higher than 3. Mikael disagrees and says that reusability is an essential parameter in developing a robot. Furthermore, Mikael says that reusability is a significant parameter when scalability becomes a factor.

> *"So I think reusable modules are really important, and especially when you scale your operation and increase the number of robots, you will probably be able to see that more and more are being recycled across the robots."*
> (KPMG, Mikael, Appendix H)

To rate the score on this parameter, both agree that a developer has the skills to rate this parameter. Mikael believes that a Process Consultant can also evaluate this parameter as they should have an overview of *Reusable Modules*.

Workload

Both consultants recognise *Workload* as a parameter to consider when developing a robot, but they do not agree with the importance of the parameter. Mikael thinks the parameter is crucial and gives it a score of 10 while Kristoffer does not think the parameter is important and gives it a score of 5. Kristoffer believes that the development often can be done faster than estimated, which is why he thinks *Workload* can be a little misleading.

For this, Kristoffer believes that an additional role will be needed to assess this parameter. He believes that the gaming perspective can play a role, which is why he also thinks there should be extra eyes to evaluate this parameter. This role can be a manager or a process consultant, so the developer does not have full control. Furthermore, Kristoffer also thinks it can be difficult for a person to assess how long a process takes to develop.

> *"So have also found that it would be advisable to have a different view of how long they think it would take, even if I have a lot of experience."*
> (KPMG, Kristoffer, Appendix I)

Process maturity

Process Maturity is a parameter that both Kristoffer and Mikael consider to be important parameters. Both consultants give this parameter a score of 8, which means they consider it essential when prioritising robot projects. Mikael mentions that a mature process is easier to automate since their processes are often more suitable for automation.

> *"...When you have a very mature process, it is easier to automate because you know reasonably well how this process unfolds."*
> (KPMG, Mikael, Appendix H)

Furthermore, both Kristoffer and Mikael consider that a process consultant should evaluate this parameter. However, Kristoffer believes that a developer may help in assessing this parameter. His practical experience has shown that process consultant do not always have the best prerequisites for assessing *Process Maturity* concerning technical perspective in *Process Maturity*.

Internal Prioritisation

Both Kristoffer and Mikael scores this parameter low in importance when automating a process. They both give it a score of 3 as both believe that it will be a political decision rather than rational decision when it comes to *Internal Prioritisation*.

> *"One should also bear in mind that these things can become a political game."*
> (KPMG, Kristoffer, Appendix I)

> *"This is pure politics, and I would say that is... As a starting point for an RPA project point of view, I want to give it a 3."*
> (KPMG, Mikael, Appendix H)

However, both believe that this parameter should help to assess the priority of RPA projects, but that this parameter is not as important as *Process Maturity*. Both Kristoffer and Mikael also believe that a leader must evaluate this parameter, as they know the internal priorities in the individual business units.

Risk Evaluation

When a risk employee needs to assess how risky the process is to automate, the employee must have several things in mind, as mentioned in the previous section. Mikael believes this parameter is essential to judge and should count a lot in the overall assessment of whether a project should be automated.

> *"I would say that, as a starting point, I won't touch the very critical processes."*
> (KPMG, Mikael, Appendix H)

Mikael believes it is crucial to assess the risk of a project failing, and if it fails, what does it mean for the process. Mikael gives this parameter seven in importance. Kristoffer does not agree with the importance of this parameter and scores it five. He agrees with Mikael that this parameter is important, but he considers

other parameters to be more important. Kristoffer considers this parameter to be binary, so it is either a risk or not a risk. Mikael disagrees with this and believes that the risk should be assessed from a scale of 1 to 10. Both have difficulty assessing whether it is a Quality and Risk employee that is to evaluate this parameter, as they believe that other roles can handle the assessment of this parameter.

Organisational vision

Both informants consider this parameter to be taken into account when automating processes, but they do not consider it equally important. Mikael believes the organisation's vision must be taken into account as this helps to improve the overall quality. Mikael gives *Organisational Vision* a score of 8. Kristoffer disagrees with Mikael and gives *Organisational Vision* a score of 3. He does not believe that robots help define the organisation's vision, but it is more technology and choice of IT systems that define the vision of the organisation.

> *"I think that [Organisational Vision] shouldn't mean much. I think that the definition of which new systems to look for, should be at a slightly higher level."*
> (KPMG, Kristoffer, Appendix I)

Both consultants believe that it is a leader who must evaluate this parameter, as they know the organisation's vision.

System count

This parameter is considered by both Mikael and Kristoffer to be one of the essential parameters when automating a process. Kristoffer considers this parameter to score 10 out of 10 in importance, and Mikael considers it to score 9.

> *"System count is important in the sense that the more systems, the more dependencies you build, so if something changes in these integrations, then your robots will be affected."*
> (KPMG, Mikael, Appendix H)

> *"And the reason is that you increase the complexity of each system you add."*
> (KPMG, Kristoffer, Appendix I)

They both mention that the more systems the process contains, the more complex it becomes to develop the robot, and therefore system number is an important parameter in prioritising automation processes. Both Mikael and Kristoffer agree that both a process consultant and a developer have the skills to assess this parameter.

System complexity

System Complexity is again one of the most important parameters, according to Michael and Kristoffer. They score this parameter eight and ten, respectively, which suggest that they believe that *System Complexity* is an essential parameter when automating a process. Mikael scores this parameter eight and says that the more complex a system is to access, the more the workload increases when developing a robot. Kristoffer agrees with Mikael and says there is a big difference between what systems a robot need to access, and that means a lot to a developer. Therefore, *System Complexity* is an important parameter when prioritising an automation project.

Documentation quality

In this parameter, there was considerable disagreement about the importance. Mikael does not believe that the quality of the existing documentation is essential and scores it 3. He has experienced that the process needs to be documented again when it has to be automated, and therefore he does not score it as high as Kristoffer.

> *"We also make our own documentation beyond that, so I don't think it's particularly important for understanding the process itself."*
> (KPMG, Mikael, Appendix H)

Kristoffer scores *Documentation Quality* 8, adding that this parameter often has a correlation with *Process Maturity*. Kristoffer, however, agrees with Mikael that the process will be documented again when it should be automated, which is why he thinks it is vital that a process consultant assists in evaluating this parameter.

Clicks and interactions

Clicks and Interactions is a parameter that both informants believes to be important when assessing the automatability. Mikael gives this parameter a score of 7 and says it is essential for a developer to know how many *Clicks and Interactions* the process contains, as the robot must perform the clicks and the interactions. He says these deviate from *System Count*, as the robot can contain only two systems, but if there are many *Clicks and Interactions*, this process can still be complicated. Kristoffer agrees with Mikael but gives this parameter a score of 10 and says

> *"So that is the whole basis of it. Speed, validity, and more."*
> (KPMG, Kristoffer, Appendix I)

Kristoffer elaborates that this parameter contains two important points. One is how many data points the process goes through, and the other is how many decision points the process must take.

> *"So how many data points ... Do you have a process with let us say 100 data points you use to make 80 decisions, then you can quickly see that it is a critical process and not something that is just being done in an afternoon. However, if you have three decisions with ten variables, it may well be done in the afternoon."*
> (KPMG, Kristoffer, Appendix I)

Both consultants agree that a developer should evaluate this process, but both say that a good process consultant can also evaluate this parameter.

Legislation pressure

For both Skattestyrelsen and LEO Pharma, *Legislation Pressure* is an important parameter when automating a process, but Mikael does not agree with the importance of the parameter. He scores this parameter one and justifies that he thinks other parameters are more important to be conscious of.

> *"So I don't necessarily think it matters whether it makes sense to automate this process or not."*
> (KPMG, Mikael, Appendix H)

Mikael thinks the *Legislation Pressure* should be a parameter in a priority process but considers it to be the least significant. Kristoffer disagrees with Mikael and gives *Legislation Pressure* a score of 10. He believes that this parameter is crucial for organisations to be aware of, and with the help of RPA, organisations can better adapt to new legislation.

> *"Therefore, RPA is a good case where you can use it to get up to date with new legislation - download data or update some systems."*
> (KPMG, Kristoffer, Appendix I)

Customer satisfaction

Mikael and Kristoffer do not agree on the importance of this parameter. Mikael evaluates this parameter to score nine and says that RPA can be used to increase customer satisfaction, which means that customers return with new orders.

> *"It's good. Because if you can increase customer satisfaction, it is often very difficult, so if you can use RPA to make our customers either internally or externally more satisfied, then I always think it's a great opportunity."*
> (KPMG, Mikael, Appendix H)

Kristoffer considers this parameter to be less important and gives it a score of 5. He recognizes the importance of this parameter but thinks other parameters are more important.

Time usage & Amount of transactions

In the first iteration, *Time Usage* and *Amount of Transactions* were divided into two different parameters. Both Mikael and Kristoffer believe that these two parameters must be put together, so they function as a single parameter. Since this parameter aims to show the total Full Time Employee (FTE) saving, they both assess this parameter to be pooled. However, one has to assess *Time Usage* and *Amount of Transactions* individually as a process can have 1000 transactions, and the time consumption takes 1 minute to complete a task.

However, both consultants believe that this parameter is very important when automating a process. They both score this parameter 10 and say that in many companies, these parameters are the basis for the decision on whether a process must be automated.

> *"This is the driver that runs eight out of ten business cases, so you can hardly do anything but give it a ten because it is simply so important. If you have high hour usage and transactions, you have a good business case if it can be automated."*
> (KPMG, Mikael, Appendix H)

Degree of automation

Both Kristoffer and Mikael mention this new parameter as an important criterion for assessing whether a process should be automated. *Degree of Automation* is defined as, how much of the process can be automated. A process cannot always be 100% automated, which is why this parameter is essential to evaluate.

> *"After all, it's always more expensive if you have to reach 100 per cent and you rarely reach it."*
> (KPMG, Mikael, Appendix H)

For this parameter, both Kristoffer and Mikael believe that a developer and a process consultant are able to complete the evaluation.

6.3.5 Summary of weights of parameters

Table 6.2 summarises the consultants' weightings on the parameters to give an overview of the weightings. Since we consider both consultants as equal experts, the weightings of both consultants count equally. To get an overall weighting, the average is taken by the experts' assessment of the parameters.

As seen in Table 6.3, the experts do not agree on the importance of the parameters. Legislation is the parameter where the experts disagree most, in which Kristoffer gives it a score of 10 and Mikael gives it a score of one. They both have different views on how vital legislation is, and they both say it is case-specific, how relevant legislation is. However, they agree on many of the parameters, among others, *Time Usage*, *Amount of Transactions* and *Degree of Automation*, as they both score them ten out of ten. Both Kristoffer and Mikael consider these parameters as very essential. Additionally, they also agree that *System Count* and *System Complexity* are significant, giving scores of nine and ten. On the *Process Maturity* parameter they also agree, that is is an essential parameter. They both give this parameter a score of 8. They do not agree with the importance of the Organisation's vision when automating a process. Mikael considers this parameter important and gives it a score of eight while Kristoffer disagrees and gives it a score of three, which is the lowest score Kristoffer has given.

As mentioned earlier, we will use the average of the experts' assessment as their contribution to the weights in our model. In the next iteration, the employees of LEO Pharma and Skatteforvaltningen make their contribution to the importance of the parameters.

6.3.6 Artefact prototype

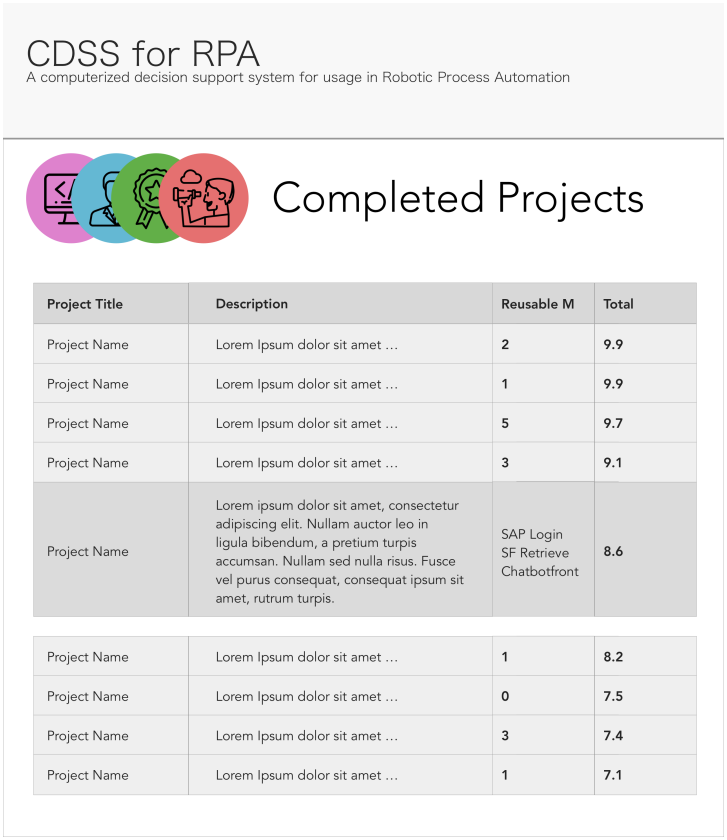
The artefact prototype in the second iteration is very similar to the one created in the initial iteration. However, a few things were added to this prototype based on the inputs from KPMG. One of them was the addition of the *Degree of Automation*, which indicates the percentages of which a process can be automated. In this view, an estimate of how much the process can be automated is given. Opposed to the other parameters, the *Degree of Automation* is not scored on a

	Mikael	Kristoffer	Average Weight
Reusable Modules	8	3	5,5
Workload	10	5	7,5
Process Maturity	8	8	8
Internal Prioritisation	3	3	3
Risk Evaluation	7	5	6
Organisational Vision	8	3	5,5
System Count	9	10	9,5
System Complexity	8	10	9
Documentation Quality	3	8	5,5
Clicks and Interactions	7	10	8,5
Legislation Pressure	1	10	5,5
Customer Satisfaction	9	5	7
Time usage	10	10	10
Amount of Transactions	10	10	10

TABLE 6.3: Parameter weights from expert interviews

scale from one to ten but an estimate of the percentage. The *Degree of Automation* will have an indirect effect on the overall priority as it subtracts time from the *Time Usage* parameter. For example, if time usage is estimated to ten minutes for each transaction, and the *Degree of Automation* is 60%, only six minutes will be included in the final prioritisation. One could argue that the *Degree of Automation* could be a direct parameter to asses the priority of an automation project, as one might not want to begin a project where only 20% of the process can be automated. However, in this framework, it will only affect the actual business case in the *Time Usage* and *Amount of Transactions*. Making it this way seems more intuitive since a low *Degree of Automation* still can be very valuable if the *Time Usage* is high enough.

Another addition to this prototype is the view of the completed projects as shown in figure 6.5. This view provides a way to keep track of every RPA project that has already been developed. You can see how each parameter was scored as well as the total score for each project at the time of prioritisation. The view gives the ability to compare projects in the backlog with projects that have already been made, to use some of the knowledge that was gathered in the development process. Furthermore, it increases transparency, which is a key aspect of this framework. Here everyone can see which automation projects have been developed, how they were scored and which business unit the process was automated for. The view of completed projects adds the ability to assess and evaluate how well the development went. It can also help evaluate if the estimates made during the prioritisation was correct by assessing the real data after the robot has been in



CDSS for RPA

A computerized decision support system for usage in Robotic Process Automation

Completed Projects

Project Title	Description	Reusable M	Total
Project Name	Lorem Ipsum dolor sit amet …	2	9.9
Project Name	Lorem Ipsum dolor sit amet …	1	9.9
Project Name	Lorem Ipsum dolor sit amet …	5	9.7
Project Name	Lorem Ipsum dolor sit amet …	3	9.1
Project Name	Lorem ipsum dolor sit amet, consectetur adipiscing elit. Nullam auctor leo in ligula bibendum, a pretium turpis accumsan. Nullam sed nulla risus. Fusce vel purus consequat, consequat ipsum sit amet, rutrum turpis.	SAP Login SF Retrieve Chatbotfront	8.6
Project Name	Lorem Ipsum dolor sit amet …	1	8.2
Project Name	Lorem Ipsum dolor sit amet …	0	7.5
Project Name	Lorem Ipsum dolor sit amet …	3	7.4
Project Name	Lorem Ipsum dolor sit amet …	1	7.1

FIGURE 6.5: Overview of all completed projects, Artefact 2

production for some time.

Besides these two additions, the framework remains the same as the one presented in Section 6.2.5.

6.4 Design of final artefact

6.4.1 Governance and decision structure

When conducting the interviews for the design of the final artefact, we did not discover many opportunities to make changes. Most of the respondents were positive about the transparency in a framework like this and were very optimistic that it could be implemented in the organisation.

> *"It also decreases potential conflicts between the units because it creates this transparency... Transparency is very important. It gives us the ability to communicate with the units without creating any conflicts."*
> (Skatteforvaltningen, Murssal, Appendix L)

Specifically, the transparency was mentioned as an important factor when prioritising projects in a way like this framework proposes. To avoid any conflicts with each unit, it is a key element to make the parameters as well as the order of the prioritisation clear for everyone.

The only change made to the final artefact in governance and decision structure is regarding the formal meetings where the final prioritisation is made. As mentioned in 6.3.3 the framework proposed a meeting every second week to finalise which projects should be initiated. However, when doing the final interviews, we discovered that more flexibility was needed if it should apply to several organisations. In Skatteforvaltningen they already had a similar meeting every quarter. Having it every second week would be a too significant change, and they even raised concern if it could be possible.

> *"Once every second week is a bit too much, because you have to involve the management and technical directors. It would be difficult to get them to attend a meeting that often."*
> (Skatteforvaltningen, Murssal, Appendix L)

Since one of the roles in the framework involves decisions and estimations made by a leader, it can be a challenge to have them involved in a meeting that often. To make the framework more comprehensive, we decided to increase the flexibility around these meetings in the final iteration. The framework now proposes that the prioritisation meetings should be held in the range of two weeks and eight weeks. This should make the framework more suited and easier to implement, as organisations often are following different agile process frameworks.

6.4.2 Parameters

In this section, the informants assessments of the parameters will be reviewed. Before each interview, the informants were introduced to the framework, and everyone had access to it. Respondents were asked to comment on the parameters and give them an importance score of one to ten. If a respondent did not feel the person had the competencies to comment on a parameter, they could choose not to comment on the individual parameter. We have done this to ensure that only those with the right competence assess the parameters.

Reusable Modules

LEO Pharma At LEO Pharma, Jesper and Jens agreed on the importance of *Reusable Modules* in automating a process. Jesper gave it a score of six and justified it with the fact that *Reusable Modules* can be important, it depends on how far the department is in the robot development process.

> *"Well, I think it has such importance, but it depends a lot on how far you are with RPA work, because the longer you work with RPA, the more reusable modules."*
> (LEO Pharma, Jesper, Appendix M)

Since RPA is fairly new in HR, they have not yet seen the importance of this parameter. Jesper also mentions that as they develop more *Reusable Modules*, the importance of this parameter may increase. Jens gives it a score of seven, so he partly agrees with Jesper, as they already focus on *Reusable Modules* in R&D. In R&D, they have more focus on robot development compared to the HR department, and this is also reflected in the scores Jesper and Jens have given for this parameter. Manos and Johnny have not scored this parameter.

Skatteforvaltningen At Skatteforvaltningen, all four respondents scored this parameter. They have scored it very differently. Tina, who has given it the highest score of eight as she considers this parameter to be crucial and mentions that the reason Skatteforvaltningen has chosen Blue Prism as a development tool is that it can use and categorise *Reusable Modules* (Skatteforvaltningen, Tina, Appendix J). Richo and Murssal disagree with Tina and give it a score of three and three and a half, respectively. They mention that this parameter does not have a substantial effect on their work, and it probably has a more substantial effect in UFST.

> *"So I think, it is not as important to us as it might be important for UFST."*
> (Skatteforvaltningen, Richo, Appendix L)

Since Richo and Murssal have no technical knowledge on the development of robots, it makes sense that they give it a low score. Carsten's score is four and also disagrees with Tina. He argues that if they do not have a *Reusable Module*, then they simply build it (Skatteforvaltningen, Carsten, Appendix K).

Workload

LEO Pharma On this parameter, Jesper considered that *Workload* has seven in importance. He justifies it with the argument that development time has a big factor when prioritising automation projects. Jesper was very much in doubt as to whether it should have seven or eight but chose to give it seven as he thought other parameters were more important than this (LEO Pharma, Jesper, Appendix M). Jens does not agree with Jesper and gives this parameter a score of five. For Jens and the R&D department, development time is not crucial to whether a process is automated. At present, R&D does not assess overall development time when prioritising automation projects but is considering dividing it into small, medium, or large projects.

> *"I've been thinking about assigning the bots like a small, medium, large, or something like that to start with..."*
> (LEO Pharma, Jens, Appendix O)

One of the reasons Jens does not score higher may be that they do not use this parameter when prioritising the current robots. Johnny and Manos have not scored this parameter.

Skatteforvaltningen All four respondents from Skatteforvaltningen have scored this parameter. Tina, Richo, and Murssal strongly agreed with the importance, and Carsten gave it a lower score than the other three. Tina, Richo, and Murssal gave this parameter six and a half and seven and a half respectively and justified it with the importance of knowing how to make the best use of internal resources.

> *"It is more important what value it gives and the political aspect, etc. So if one looked from the inside, from the office of Process Automation, it would be important so that we could use resources best possible."*
> (Skatteforvaltningen, Tina, Appendix J)

At Richo and Murssal in DigiPof, they have learned that if Skattestyrelsen can solve several small tasks rather than one big, then the business will be happier, and therefore they evaluate this parameter to score six and a half and seven and

a half (Skatteforvaltningen, Murssal, Appendix L). Carsten does not agree with the other three and scores this parameter three. He does not believe that development time matters to him as a developer when automation projects need to be prioritised (Skatteforvaltningen, Carsten, Appendix K).

Proces maturity

LEO Pharma At LEO Pharma, there was disagreement about the importance of this parameter. Jesper from the HR department considers this parameter to be one of the most important and gives it a score of 10.

> *"What I would personally say is a clear ten. If there is no control over the process is standardized or have found all business exceptions, then it can make the workload change a lot."*
> (LEO Pharma, Jesper, Appendix M)

Jesper also mentioned the importance of this parameter in the first iteration, and for him, *Process Maturity* is crucial to whether a process can be automated. Jens does not agree with Jesper and gives *Process Maturity* a score of four. At R&D, they evaluate *Process Maturity* differently than in HR and therefore, Jens does not consider this parameter to be as important as Jesper does.

> *"Just that we assess the maturity of the process in a very simplified way. So if we assess it to be immature, then maybe we would tell the business that no, you have to do this and that before we can automate."*
> (LEO Pharma, Jens, Appendix O)

Jesper and Jens strongly agree that the process must be mature before it can be automated, but at HR, this parameter means more than at R&D as they do not have the same resources to optimise the process. Johnny and Manos have not considered this parameter.

Skatteforvaltningen Tina assesses *Process Maturity* as having five and a half importance. She mentions that this parameter is an important parameter because if the process is not controlled, it can have consequences in the end in the development of the robot.

> *"We can see what the challenges are in the places we have had to carry out tasks in which the process is not mature or where there has not been a process at all and it gives an incredible amount of spaghetti code in the end."*
> (Skatteforvaltningen, Tina, Appendix J)

Richo, Murssal and Carsten agree with Tina that the *Process Maturity* is important and gives it a higher score. Richo scores it eight and justifies with they often prioritise large processes, and processes that are heavy to do manually (Skatteforvaltningen, Richo, Appendix L)

Internal Prioritisation

LEO Pharma *Internal Prioritisation* is a parameter that all four respondents at LEO Pharma have considered. Manos and Jens consider this parameter to be essential and score it respectively eight and a half and eight. Jens focuses on the importance of prioritising the internal tasks for the individual business units themselves. Manos agrees and states:

> *"I would say it's very important because we want the freedom to be able to decide what is adding more value to the business so I will give it eight."*
> (LEO Pharma, Manos, Appendix N)

Jesper agrees with the others and scores this parameter six. He argues that each business unit can have individual tasks that they want automated before others. Johnny is more sceptical and says that as a starting point, one will always consider internal tasks to be very important, he estimates this parameter to seven in importance.

Skatteforvaltningen At Skatteforvaltningen, all four respondents also assessed this parameter. They have all considered this parameter to be important, and Richo and Murssal have scored this parameter seven. They both agree that each business unit has different priorities for the importance of internal projects, and therefore they believe this parameter is important (Skatteforvaltningen, Richo, Appendix L). Tina agrees with Richo and Murssal and gives this parameter a score of eight. She elaborates that people become more dedicated when prioritising internal projects (Skatteforvaltningen, Tina, Appendix J).

> *"... I think internal prioritisation is super important because it makes people dedicated ..."*
> (Skatteforvaltningen, Tina, Appendix J)

Carsten agrees with Tina and gives this parameter a score of nine. He argues that they would rather make robots that benefit each business unit the most.

Risk Evaluation

LEO Pharma All four respondents have assessed this parameter at LEO Pharma. Johnny and Manos rate this parameter to score ten. They both consider the risk of developing a robot, and the consequence of this as the most important when automating a process. They justify this because they work in an industry where they have to take all risks into account. Furthermore, they now use a risk tool in which they have had great success. Jesper does not agree with the importance of this parameter and only gives it a score of five.

> *"As a developer, I think this one should not be weighted as high because I think it's something that slows development."*
> (LEO Pharma, Jesper, Appendix M)

Jesper agrees that this is a parameter that should be evaluated, but he does not believe this parameter should be weighted as much as other parameters, since this can slow down the innovation and development of new robots.

Skatteforvaltningen Tina considers this parameter to be ten of importance, and she justifies it as Skatteforvaltningen being a public organisation that spends taxpayer money on developing the robot. Therefore, it is important that they do not develop robots that are at high risk. From the above, Tina considers this parameter to be crucial to whether a process should be automated (Skatteforvaltningen, Tina, Appendix J). Carsten agrees with Tina that this parameter is an crucial parameter when automating a process. He uses the same reasoning as Tina and elaborates:

> *"... It has to do with Skatteforvaltningen being managed by the economy of citizens and businesses, the economy of society, so the things we do, they have to be correct. So assessing the risk is a high parameter. The higher the risk, the greater the test requirement."*
> (Skatteforvaltningen, Carsten, Appendix K)

Richo and Murssal also acknowledge that *Risk Evaluation* is a parameter that should be taken into account and evaluate the parameter seven and five, respectively. They mention that they do not work much with this parameter, and it is more UFST who is currently evaluating this.

The above comments from both the private and the public organisations is not in line with the expected results that stems from the literature on public and private differences, as there is only marginal differences between the two organisations.

Organisational Vision

LEO Pharma The four respondents at LEO Pharma scores *Organisational Vision* very differently. Jesper and Jens do not consider this parameter to be as important when automating a process as Johnny and Manos. Jesper scores this parameter one and justifies it by not believing that the organisation's vision should judge what is being automated (Jesper). Jens considers this parameter to score three out of ten and justifies it as he still considers that LEO Pharma is at the beginning of their RPA journey and initially, robots should not be developed based on the organisation's vision.

> *"I would think that in the beginning, RPA is more about creating efficiency and leaving policing resources to the business so, I rate it that high."*
> (LEO Pharma, Jens, Appendix O)

Johnny and Manos do not agree with Jesper and Jens, and both assess this parameter to score ten. Since both Johnny and Manos have leadership roles and not directly involved with the development of the robot, both Johnny and Manos evaluate this parameter from a management perspective. They follow the theory that the IT strategy and the organisation's overall strategy must be aligned and therefore, it makes sense that Johnny and Manos score this parameter ten.

Skatteforvaltningen At Skatteforvaltningen, Tina scores this parameter lowest of the four respondents. Tina scores this parameter four as she believes it is often difficult to find the connection between Skatteforvaltningen's overall strategy and the development of robots. Richo and Murssal both disagree with Tina and score this parameter ten and nine respectively.

> *"But the background for the prioritisation comes from the organisational vision, which is what is important for the organisation to do."*
> (Skatteforvaltningen, Richo, Appendix L)

With the quote above, Richo refers to themselves as always trying to prioritise based on what is most important to the entire organisation. Carsten also agrees with Richo and Murssal and states that it is their entire objective to contribute to Skatteforvaltningens overall goal (Skatteforvaltningen, Carsten, Appendix K).

Using our abductive mindset, we refer back to the theory and are quite surprised of the above result. We would expect for the private organisation to be more grounded in their own sub-division while we would expect the public organisation to be even more focused on the collaborative efforts and the good of

the entire organisation. This is contradictory with the empirical findings. However, since the scores on *Organisational Vision* is relatively high it still aligns with the literature on IT governance. The literature states that the IT strategy must be aligned with the business.

System Count

LEO Pharma At LEO Pharma, Jesper and Jens have evaluated this parameter. They have both scored it with six in importance. Jens mentions that they also evaluate this parameter in R&D now, and that they have started this recently. It has given them a good picture of how many systems the robot has to access. Jens further adds that this parameter has filled in a deficiency they had previously (LEO Pharma, Jens, Appendix O). In HR, Jesper mentions that it is not currently prioritised, but recognises that it is important as a developer to know how many systems the robot needs to access (LEO Pharma, Jesper, Appendix M). This parameter has not been evaluated by Johnny or Manos.

Skatteforvaltningen Tina and Carsten have evaluated this parameter for Skatteforvaltningen. Carsten scores this parameter three as he does not think it is of great importance for prioritising automation projects.

> *"It is not the number of the system we take into consideration when we develop solutions. We also have solutions in progress with many systems in place."*
> (Skatteforvaltningen, Carsten, Appendix K)

For Carsten, it is not important to know how many systems the robot should access, but rather the complexity of accessing the systems, which is the next parameter. Tina scores this parameter seven and a half and elaborates that the more systems to access, the higher the risk (Skatteforvaltningen, Tina, Appendix J). Murssal or Richo has not evaluated this parameter.

System Complexity

LEO Pharma Both Jesper and Jens have scored this parameter and Jesper has scored this parameter eight. He believes it is essential as a developer to know the complexity of accessing the systems as this can increase the overall workload (LEO Pharma, Jesper, Appendix M). Furthermore, Jens says that they also currently use the *System Complexity* to assess the overall business case. Jens scores this parameter five. He thinks it is more important to know how many systems

to use, as he has learned that this requires more code. Johnny and Manos have not estimated this parameter.

Skatteforvaltningen At Skatteforvaltningen, Tina has scored this parameter four, with many of the same arguments that Jens from LEO Pharma uses. Since *System Complexity* and *System Count* may be interdependent, Tina also considers that *System Count* is more important. Carsten does not agree with Tina and believes that *System Complexity* is more important than *System Count*.

> *"So complexity is really what makes an estimation difficult because if there is high complexity, it often means that we have to search for some things to find out how to handle it. Try us a little ahead or investigate a lot or grab external partners to resolve issues, so it's something that will affect development time and that's why I think it's reasonably important."*
> (Skatteforvaltningen, Carsten, Appendix K)

Carsten scores this parameter six from the above quote. Richo and Murssal have not estimated this parameter.

Documentation Quality

LEO Pharma Both Jesper and Jens consider this to be an important parameter. They both score the current *Documentation Quality* to nine out of ten. Jesper mentions that it helps to ensure that the robot does the right thing when it is fully developed. In addition, Jesper adds:

> *"... I think it is important to have a high documentation quality, both for the line of business so it is sure that the robot does what it needs to do, there is more transparency and that if a new employee arrives, they get faster into it."*
> (LEO Pharma, Jesper, Appendix M)

Jesper mentions that it helps new employees to understand the process better the higher the *Documentation Quality* is. Jens mentions that they may tend to over-document their processes because they are a pharmaceutical company, which have many restrictions, but he agrees with Jesper that documentation is important.

> *"Since we are a pharma company, documentation is really important for us to save it that way that we can show to authorities that we are in control of*

> *how we run our processes and also how we automate our processes. "*
> (LEO Pharma, Jens, Appendix O)

Manos and Johnny have not considered this parameter.

Skatteforvaltningen All four respondents from Skatteforvaltningen assessed this parameter. Richo and Murssal have scored this parameter nine and ten respectively, and Carsten and Tina scored it five and two and a half respectively. Richo has discovered that if the *Documentation Quality* is low, the quality of the robot will also be poor.

> *"Then there is no reason for us to request a robot if the process is not documented properly."*
> (Skatteforvaltningen, Richo, Appendix L)

Carsten points out that good *Documentation Quality* helps with the understanding of developing a robot, which is why he scores this parameter five. Tina does not agree with the importance of this parameter. She says that they still make new documentation every time a process has to be automated. As a result, the quality of the current documentation is almost irrelevant to Tina (Skatteforvaltningen, Tina, Appendix J).

Clicks and Interactions

LEO Pharma Both Jesper and Jens have assessed this parameter. They have both rated this parameter as three, so neither of them considers it to be an essential parameter when automating a process. Jens mentions that they do not currently evaluate this parameter when prioritising the development of robots in R&D, and they have not needed it (LEO Pharma, Jens, Appendix O). Jesper mentions that he does not consider it important for current processes to know how many *Clicks and Interactions* the process contains. (LEO Pharma, Jesper, Appendix M)

Here they do not agree with the theory of automation criteria, where this is an important parameter for whether a process should be automated. However, both Jens and Jesper currently assess this parameter in LEO Pharma, but they do not believe that this a crucial parameter when prioritising robots. Johnny and Manos have not considered this parameter.

Skatteforvaltningen At Skatteforvaltningen, Tina and Carsten have assessed this parameter. Carsten scores this parameter six and says that the more interactions a robot have, the greater the complexity.

> *"... And if there are a lot of interactions, it also increases the complexity, so those things are a bit connected. It also increases the logic that needs to be built up in the robot."*
> (Skatteforvaltningen, Carsten, Appendix K)

Tina scores this parameter four and a half and justifies it with, it is not important to UFST as it was at the beginning of their RPA journey. Neither Richo nor Murssal has scored this parameter.

Legislation Pressure

LEO Pharma At LEO Pharma, all four respondents have evaluated this parameter. Jesper has scored it four and Johnny and Jens have both scored it five. Although Jesper sees the possibility that legislation may allow for the development of robots, he does not consider this to be an important parameter for the development of robots in LEO Pharma (LEO Pharma, Jesper, Appendix M). Jens agrees with Jesper but has not considered that legislation has affected the development of robots yet. He may well see in the future that legislation lead to some development of robots.

Manos considers this parameter to score nine, as he mentions fines and bad publicity as a risk if the legislation does not comply. He believes the robots can help comply with legislation.

Skatteforvaltningen At Skatteforvaltningen, this parameter is the most important based on interviews in iteration three. With an average score of 9.25 based on Skatteforvaltningen's score on this parameter, it is not surprisingly the most important parameter for Skatteforvaltningen. Carsten scores this parameter eight and states:

> *"Legislation is of great importance to Skatteforvaltningen so the legislative and auditory is something that is looked at with serious eyes so it must be placed high."*
> (Skatteforvaltningen, Carsten, Appendix K)

Carsten refers to Skatteforvaltningen as a public organisation that is subject to government rules, and they must comply with Danish law. Tina gives this parameter nine importance and mentions examples of robots that they have been forced to make because of new Danish legislation. Murssal and Richo give this parameter ten and Murssal elaborates that when assignments come from the ministry, they have priority.

> *"I agree, so if there is something that comes from the ministry and from above we always will make sure to prioritise them."*
> (Skatteforvaltningen, Murssal, Appendix L)

Customer Satisfaction

LEO Pharma At LEO Pharma, Jesper and Jens have evaluated this parameter. Jesper has scored this parameter seven because he must cooperate with the customer during the development of the robot. The happier the customer will be for the robot, the more effort the customer will provide with information about the process. Jens mentions that they have not measured customer satisfaction yet, but thinks it is an important factor when developing a robot and something they will do in the future and therefore, he scores this parameter eight.

> *"Get some feedback to see if doing things right or not. We do work close to the customers though. So they are involved in the design of the solution and the design of the testing, etc. So I would expect the customers to be satisfied since they have been involved so closely, but an excellent idea to measure it."*
> (LEO Pharma, Jens, Appendix O)

Neither Manos nor Johnny have estimated this parameter.

Skatteforvaltningen In Skatteforvaltningen, all four respondents have assessed this parameter. However, this parameter is not as highly weighted among respondents in Skatteforvaltningen compared to many other parameters. Murssal scores this parameter highest with a score of six and justifies it with the fact that there is too much focus on politics and legislation that *Customer Satisfaction* is not given equal priority. Carsten agrees with Murssal and scores this parameter four.

> *"It also matters when tasks are selected. Can we increase customer satisfaction too, for citizens and businesses, but also for the internal customers we have. The boards we make solutions for."*
> (Skatteforvaltningen, Carsten, Appendix K)

Carsten also states that politics and legislation are often more critical, which is why it is not scored higher than four.

Time usage

LEO Pharma This parameter has been assessed by all four respondents from LEO Pharma. They have all scored this parameter to be either nine or ten. The time spent on the process is an important parameter for LEO Pharma respondents. Jens mentions that this is one of the most important parameters along with the *Amount of Transactions* as this calculates how much LEO Pharma saves on developing the robot (LEO Pharma, Jens, Appendix O). Jesper agrees with Jens and also considers this parameter to be very relevant as this helps to calculate FTE savings (LEO Pharma, Jesper, Appendix M).

Skatteforvaltningen In Skatteforvaltningen, only Tina scores this parameter as a nine. She believes that this parameter helps to calculate the FTE saving for the robot. Carsten also considers this parameter important and agrees with both LEO Pharma and Tina that it is essential to know how much savings the robot gives. Richo and Murssal do not consider this parameter to be as important as LEO Pharma, Carsten and Tina. They score this parameter four and five as the definition of the time consumption of a process varies widely in Skattestyrelsen.

> *"You can say that the performance when talking about a process, when we talk to our business, then it is very different how they understand what a process is, that there are some who see a process like that is something that only takes a minute, and then some see a process as it is a whole task and it takes 30 minutes to do."*
> (Skatteforvaltningen, Richo, Appendix L)

Amount of Transactions

LEO Pharma This parameter was scored together with *Time Usage*, with Jesper giving it 9 and the other three giving it 10. They also all mention that *Amount of Transactions* is used together with *Time Usage* to calculate FTE savings. Johnny mentions that he would score this parameter 11 if he could do it (Johnny, LEO Pharma, N). This reflects that this parameter and *Time Usage* are two parameters that mean a lot to LEO Pharma when automating a process.

Skatteforvaltningen At Skatteforvaltningen, Carsten scores this parameter seven, and Tina scores it nine. As previously mentioned, the FTE saving is important

for Skatteforvaltningen, why they give this parameter a high score. Richo scores it as a seven which is slightly higher than *Time Usage*.

Automation-degree

Both Mikael and Kristoffer from KPMG and Carsten from Skatteforvaltningen highlighted the need for a parameter named Automation-degree. (Skatteforvaltningen, Kristoffer, Appendix I), (KPMG, Carsten, Appendix K) This parameter is a part of a calculation with *Amount of Transactions* and *Time Usage*.

This parameter is not weighted by the case organisations like the other parameters and does not include a weight. The parameter instead works as a multiplier of the Transaction Amount parameter. If a process has 1000 transactions a month at five minutes each, but only has an Automation-degree of 50%, the case will receive a final time-usage saved per month of 2500, instead of 5000. The calculation can be seen on Listing 6.1

```
1  const array_rating = [8454, 1740, 6554, 4353, 5432]; //Set an array
       with some sample-projects.
2
3  var timeusage = readlineSync.question('What is your time-usage in
       minutes per process? ');
4  console.log('Great. ' + timeusage + ' minutes have been noted!');
5  var transactions = readlineSync.question('What is your amount of
       transactions per month? ');
6  var automation_degree = readlineSync.question('How many percent of
       the transaction time per month do you expect to automate? ');
7
8  new_entry = (timeusage * transactions) * automation_degree; //
       Calculates the expected automatable time usage per month
9  array.push(new_entry); //Adds the new entry to the array
10 MAX = Math.max(...array) //Find the max of the current array, as the
        score is calculated in relation to this
11 rating = new_entry / MAX //Find the relationsship
12 rating = Math.round((rating + Number.EPSILON) * 1000) / 100 //Round
       the number to get something between 1 and 10
13
14 console.log('Great. ' + transactions + ' transactions, and each
       takes around ' + timeusage + ' minutes to finsh, and you expect
       to save ' + automation_degree + '. That is a total of ' +
       new_entry + ' minutes spent on this process a month. \nYou have
       received a rating of ' + rating);
```

LISTING 6.1: Conversion of Time Usage, Amount of Transactions and Automation Degree to a dynamically calculated rating.

Summary of weights

Following the analysis of the input from each informant we have summed up the weights of the given parameters in table 6.4.

	KPMG		LEO Pharma			Skatteforvaltningen			
	Mikael	**Kristoffer**	**Jesper**	**Johnny**	**Manos**	**Jens**	**Tina**	**Richo**	**Mursal**	**Carsten**
Reusable Modules	8	3	6			7	8	3.5	3	4
Workload	10	5	7			5	6.5	6.5	7.5	3
Process Maturity	8	8	10			4	5.5	8	7.5	7
Internal Prioritization	3	3	6	7	8.5	8	8	7	7	9
Risk Evaluation	7	5	5	10	10	7	10	7	5	9
Organizational Vision	8	3	1	10	10	3	4	10	9	8
System Count	9	10	6			6	7.5			3
System Complexity	8	10	8			5	4			6
Documentation Quality	3	8	9			9	2.5	9	10	5
Clicks and Interactions	7	10	3			3	4.5			6
Legislation Pressure	1	10	4	5	9	5	9	10	10	8
Customer Satisfaction	9	5	7			8	3.5	5	6	4
Time usage	10	10	9	10	10	10	9	4	5	7
Amount of Transactions	10	10	9	10	10	10	9	7	5	7
Average	7.2	7.1	6.4	8.7	9.6	6.4	6.5	7.0	6.8	6.1

TABLE 6.4: Given weight of parameters from each respondent

6.4.3 Data analysis

This section will analyse some of the key data collected when creating the weight of each parameter. It is important to note that due to the very few observations in our dataset, the quality of such analysis will never be completely satisfying. However, despite the low observations, there are still some interesting data to analyse in the answers of the respondents. Table 6.4 in the section above, illustrates how the respondents weighted each parameter on a scale from one to ten. Based on these responses, the average, median, difference and variance have been calculated to analyse the data further.

To compare the answers of the respondents, an average for both KPMG, Skatteforvaltningen and LEO Pharma has been made. The overall average combines the responses from all three organisations and will be used as the final weight to rank projects in the framework. The average has been chosen oppose to the median, as it represents the response from each respondent in a more equal and balanced way. If the dataset had contained more observations, using the median might be wise as it better accounts for any extreme outliers. However, in a dataset like this, we do not have a legitimate reason for discarding outliers, and each observation should be weighted equally.

Looking at the differences in table 10.3 in the appendix, there are several interesting data points to analyse. When only comparing Skatteforvaltningen and LEO Pharma, *Legislation Pressure* stands as one of the parameters with the highest difference at 3.5. As Skatteforvaltningen weights this parameter significantly higher than LEO Pharma, it could indicate that legislation pressure is more common in a public organisation. The parameter *Time Usage* also has a significant difference between Skatteforvaltningen and LEO Pharma. Even though both organisations rate it quite high, the average score from LEO Pharma is 9.8, which also gives a difference in 3.5 between the two organisations. This might also be an indication of how the private sector mostly focuses on the business case itself. This was underlined by Jens, as they are heavily evaluated on time back to business as part of their KPI (LEO Pharma, Jens, Appendix O).

When adding the average of the answers from KPMG to both Skatteforvaltningen and LEO Pharma, the mean difference between all parameters is 1.05. The table also shows that Skatteforvaltningen had a higher difference to the answers from KPMG, which were based on their expert knowledge on working with RPA for many years.

The calculations of the variance can be found in table 10.4 in the appendix. It indicates how much the answers fluctuates from the average. The variance was calculated for both KPMG, Skatteforvaltningen and LEO Pharma but also a combined variance for all the answers.

Analysing the variance for Skatteforvaltningen alone, a key point is at the *Documentation Quality*. A variance of 9.2 indicates internal disagreement on how this parameter should be weighted. The process consultants weight it very high, and the leader and developer lower. From a developer standpoint, an explanation could be that they almost always will have to create the documentation again, as it is very unusual that the quality of the existing documentation is enough to make a software robot.

At LEO Pharma, the highest variance was found at *Process Maturity*. However, it is essential to note that only two of the respondents weighted this parameter, which increases the likelihood of high variance. Between the developer and the process consultant, a variance of 9 is found.

Another interesting aspect to analyse is the differences the answers of each role. Table 6.5 shows the difference between the answers of the leaders, process consultants and developers.

	PRO	**LEA**	**DEV**
PRO	0	1.96	1.37
LEA	1.96	0	2.11
DEV	1.37	2.11	0

TABLE 6.5: Difference in answers from each role

The highest difference is found between the leader and the developer. Perhaps not surprisingly as one could argue that the developer is the one closest to the technology, the leader is taking decisions on a higher level and the process consultant as a bridge between the two.

Table 6.6 illustrates the difference between how each role weighted the parameters in Skatteforvaltningen compared to LEO Pharma.

	Skatteforvaltningen	**LEO Pharma**	**Difference**
PRO	7.17	8.38	1.21
LED	8.17	8.67	0.50
DEV	6.14	6.43	0.29

TABLE 6.6: Roles, Skatteforveltningen vs. LEO Pharma

Key takeaways are that the leader and developer have similar thoughts on the importance of the parameters, but the process consultants disagree a bit more with a mean difference of 1.2. These differences indicate some areas it potentially would be relevant to optimize the weight.

6.4.4 Final prototype

This section will present a summary of the final prototype made in the third iteration. A more in-dept explanation of each element can be found in Section 6.2.5 and 6.3.6 when the first and second prototype was presented.

The framework consists of 14 parameters as shown in Figure 6.6 and table 6.7. The parameters has been given weights based on the analysis of all the parameters in Section 6.4.2.

The weights used in the final prototype are based on the average estimate from all respondents. Among some of the most essential parameters, with a weight of at least 7, are; *Amount of Transactions*, *Time Usage*, *Risk Evaluation*, *Process Maturity* and *Legislation Pressure*. The final weights can be found in table 6.7.

	Final Weight
Reusable Modules	5.3
Workload	6.3
Process Maturity	7.3
Internal Prioritisation	6.7
Risk Evaluation	7.5
Organisational Vision	6.6
System Count	6.9
System Complexity	6.8
Documentation Quality	6.9
Clicks and Interactions	5.6
Legislation Pressure	7.1
Customer Satisfaction	5.9
Time usage	8.4
Amount of Transactions	8.7

TABLE 6.7: Final Prototype: Weights

Moreover, a description for all the parameters can be found in Figure6.6.

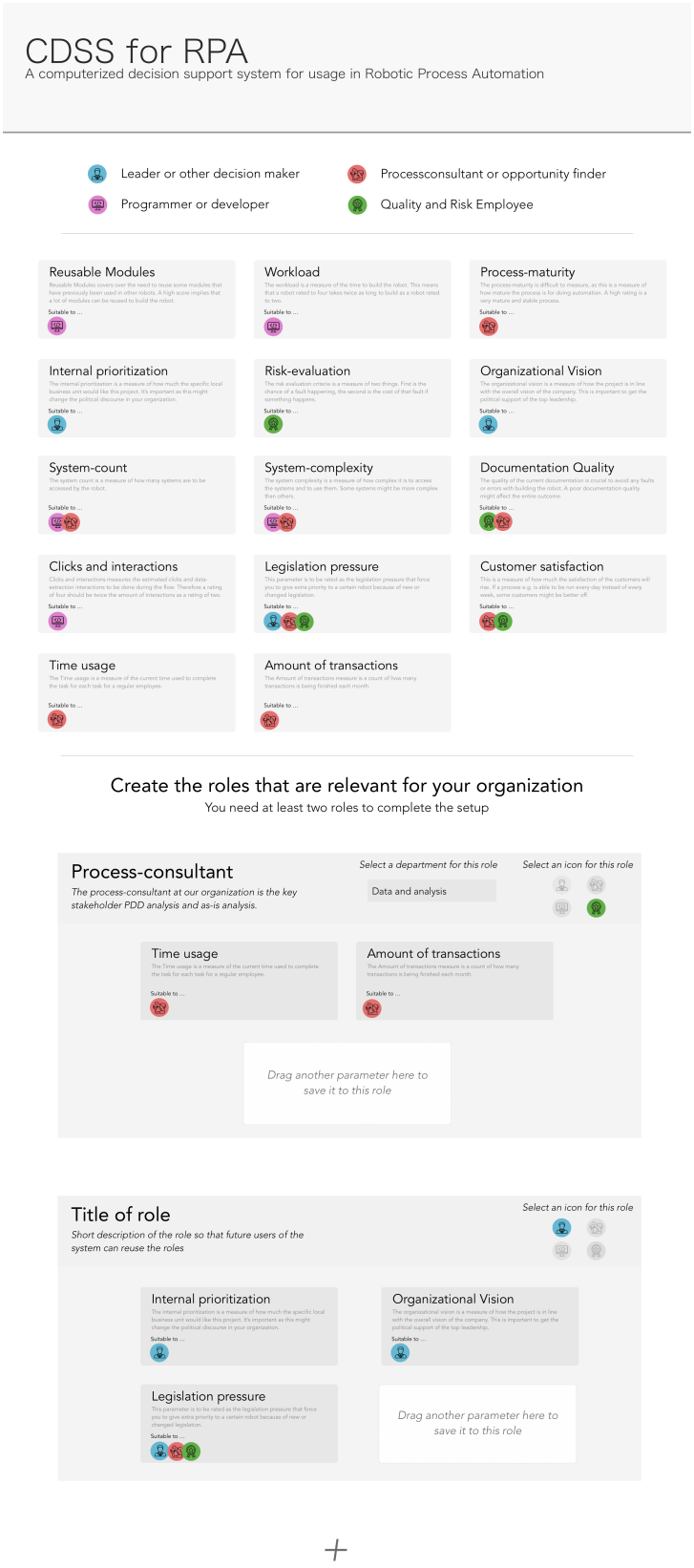


FIGURE 6.6: Parameters and roles, Final artefact

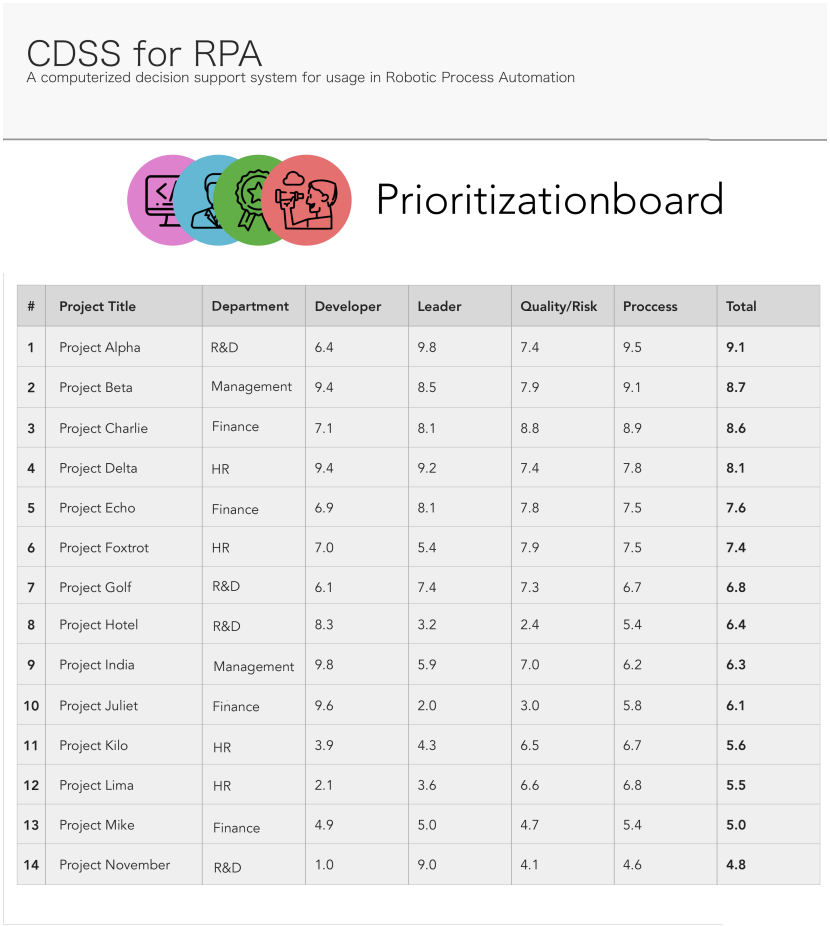
Prior to the development, each parameter will be scored on a scale from 1 to 10 by the relevant role. Each parameter can be manually assigned to the relevant role in the organisation. Four predefined roles have been created in the framework; Leader, Process consultant, Quality and Risk Employee and Developer. As the roles might differ from organisation to organisation, it is possible to create new roles with custom tiles and icons.

The personal view gives an overview of the parameters assigned to your role.

FIGURE 6.7: Personal View, Final Artefact

It also shows the projects overall score from the estimates given by your role. Figure 6.7 illustrates an example of the personal view of a developer after that person has scored a project. In this case, the weighted average from the estimates of that role is 5.6.

The framework proposes a meeting at the prioritisation board every 2 to 8 weeks depending on how it suits the organisation's process model. At this meeting, there should be representatives from each business unit to ensure an outcome everyone can be satisfied with.



#	Project Title	Department	Developer	Leader	Quality/Risk	Proccess	Total
1	Project Alpha	R&D	6.4	9.8	7.4	9.5	**9.1**
2	Project Beta	Management	9.4	8.5	7.9	9.1	**8.7**
3	Project Charlie	Finance	7.1	8.1	8.8	8.9	**8.6**
4	Project Delta	HR	9.4	9.2	7.4	7.8	**8.1**
5	Project Echo	Finance	6.9	8.1	7.8	7.5	**7.6**
6	Project Foxtrot	HR	7.0	5.4	7.9	7.5	**7.4**
7	Project Golf	R&D	6.1	7.4	7.3	6.7	**6.8**
8	Project Hotel	R&D	8.3	3.2	2.4	5.4	**6.4**
9	Project India	Management	9.8	5.9	7.0	6.2	**6.3**
10	Project Juliet	Finance	9.6	2.0	3.0	5.8	**6.1**
11	Project Kilo	HR	3.9	4.3	6.5	6.7	**5.6**
12	Project Lima	HR	2.1	3.6	6.6	6.8	**5.5**
13	Project Mike	Finance	4.9	5.0	4.7	5.4	**5.0**
14	Project November	R&D	1.0	9.0	4.1	4.6	**4.8**

FIGURE 6.8: Prioritisation-board, Final Artefact

Figure 6.8 illustrates a simple overview of all projects that will be discussed during the meetings. The grading should be viewable so that decisions can be taken swiftly and effectively. It is important to note that the order of the projects does not necessarily mean that the top projects should be initiated. This framework should be seen as a foundation for discussion on prioritising the backlog, so everyone is satisfied.

During the meeting, each of the projects can be scrutinised by clicking on the title. This will show an overview of all the ratings the given projects have received by each role.

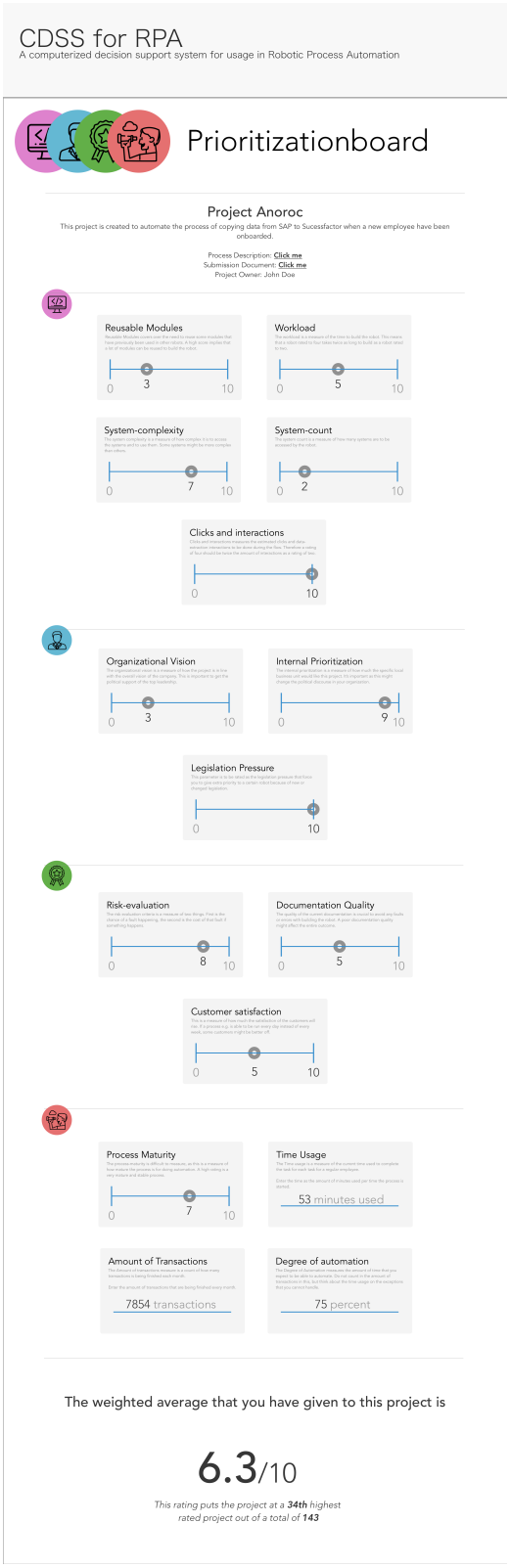


FIGURE 6.9: Overview of role ratings, Final Artefact

When a project is clicked on in the overall view, the individual ratings are shown to the meeting participants, but these are not editable.

The page also contains a short description of the project as well as links to the process description and the document that was used in the submission of the project. The page can be seen in figure 6.9

Finally, the framework includes a page with all the finished projects providing full transparency all the way through the life of an automation project. Figure 6.10 shows an example of a page with all the completed projects in an organisation.

FIGURE 6.10: Overview of all completed projects, Final Artefact

Chapter 7

Discussion

7.1 Introduction

During this section, we will discuss the practical implications focusing on how the proposed framework can be used in practice. Furthermore, we will discuss the theoretical implications this study has demonstrated, focusing on the three main theoretical concepts; automation, IT governance and decision structure. The findings in relation to the current literature will be considered, focusing on the contributions this study has given to the literature. Following the discussion on the implications, the study limitations will be discussed. We are aiming to give an overview of all the limitations this study has had. Finally, the future research opportunities of this study will be discussed in which we consider five proposals for future research.

7.2 Practical Implications

Organisations around the world explore methods on how to quantify their backlog of automation projects. Our proposed framework allows them to get a more trustworthy overview of which projects are suitable for automation through RPA. By adopting the framework, it allows organisations to prioritise their backlog using both current theory and empirical data from two case organisations. By prioritising which projects are most optimal for the organisation to choose, the organisation has a better indication of the suitability for automation. This tool can provide evidence for choosing processes to automate, but we recognise that all organisations are different, so this tool does not necessarily offer a final solution for assessing the automatability. However, it can provide a basis for discussion between the individuals who must decide which projects that must be automated. This tool can give organisations an upgraded overview of their backlog and thus has a more refined basis for choosing the projects to be automated.

Since all organisations are different and have different roles, it may be difficult to define some specific roles to suit all organisations. This thesis suggest four roles, which are selected from empirical data and theory. These four roles includes a leader, a developer, a process consultant and a quality and risk employee. Our framework may have a challenge in representing all roles in an organisation. Therefore, the organisation has the opportunity to define roles within the framework, which allows them to determine the title of the role, and they can themselves decide which role assesses which parameter. By doing this, the unique organisation is granted the opportunity to adapt to the framework itself. We recognise that it can be challenging to impose the role to a specific parameter, and therefore we have composed a suggestion of who should evaluate the individual parameters. This is not a final decision, and companies can decide for themselves what role to assess for each parameter, optimising the utilisation of the employees tacit knowledge.

In addition, some people may also have multiple roles in an organisation, if the organisation has a small size. This could mean that a person can potentially evaluate most of the parameters, which suggests that this person can almost solely determine the priority of the projects in the backlog. For some of the parameters, it can be challenging to decide which role to evaluate, as several roles can have an impact on it. However, it is up to the individual organisation to assess which role is best suited. The consultants were not satisfied with the Quality and Risk role as they did not consider it to be suitable in this context. However, we have chosen to include it regardless as the theory asserts that this role is essential in prioritising IT projects. The two case organisations could fully recognise the importance of this role, which is why we have chosen to retain this role as a starting point for the organisations.

It is the individual roles that must evaluate each parameter, and in this study, we acknowledge that dishonesty can occur if a person decides to give 10 in all the parameters that the role should assess. We recognise that this is possible, and gaming theory may arise. Through communicative rationality the employees will seek the truth. Furthermore, it can be challenging to assess which business unit should evaluate the parameters. It is generally crucial for companies to evaluate the parameters objectively, and to choose the correct people to assess the parameters.

We have established 14 parameters that need to be evaluated to prioritise the automation projects. These 14 priorities have been selected from the theory and empirical data from Skatteforvaltningen and LEO Pharma. In this tool, we have selected the parameters based on three iterations, and also weighted them in importance. These parameters have been carefully selected through the iterations. We recognise that this may be a weakness for the framework, as not all organisations are the same.

Furthermore, organisations do not have the opportunity to add a parameter. The advantage of this is that the parameters are rigorously selected, and they are chosen on the basis of a general principle to suit a broad range of organisations. This means that organisations cannot add a parameter that is not important in prioritising automation projects.

One of the selected parameters is *Legislation Pressure*, which can be interpreted in many ways. In this study, we noticed that legislation pressure has a different impact on the two case organisations, and they interpret this parameter individually. Since LEO Pharma is a private company and Skatteforvaltningen is a public organisation, they are subject to different legislation and therefore to different views on what legislation might include. Where some respondents interpreted the legislation as a negative factor in relation to RPA as it makes the process even more complex, others saw it as an opportunity to support the legislation even better as it is less prone to human error. We recognise that *Legislation Pressure* is a broad term, but since all organisations, public and private, are subject to legislation, this parameter is sustained.

With our pragmatic approach, we recognise that this framework may not necessarily help all organisations to select processes for automation, but it can help organisations have a better starting point in the selection process. As mentioned earlier, the proposed framework should be considered a starting point for discussion, which can lead to more conflicts in specific organisations. At DigiPof in Skatteforvaltningen, they currently use a comprehensive prioritisation tool to prioritise both Machine learning projects, RPA projects, and BPM projects.

Our proposed framework only prioritises RPA projects, which means that DigiPof must have other prioritisation tools to prioritise the other technologies if they choose to use our framework. Both Skatteforvaltningen and LEO Pharma think the proposed framework is an excellent alternative to their current prioritisation tool, and both organisations expressed great enthusiasm for the system.

However, they all suggested that some fixes are required before they can ultimately adopt the system, such as e.g. support for Azure DevOps and organisational-specific risk analysis documents.

7.3 Theoretical Implications

This study presents numerous contributions to the current research on the RPA prioritisation process. We intended to use the current literature in combination with empirical data, to outline several automation criteria for prioritisation of the current backlog. Adding research on decision structure and IT governance, a substantial literature foundation has been achieved. Thus, our starting point was to identify the current criteria for automation written in the literature to achieve a broader understanding of RPA, and its potential. Hereafter, we increased our focus to the IT-governance and the decision structure for organisations, both in the public and the private sector. In this section, the three theoretical concepts will be discussed by focusing on our proposed implications.

7.3.1 Implications for the automation criteria

There has been an insignificant literature foundation on the automation criteria literature, which has made it difficult to find relevant articles in this field. However, the current literature on prioritising RPA processes mostly contains quantitative parameters that must be met before a process can be automated. These quantitative parameters are mentioned in section 2.4.3, and many of the parameters have also been used to structure our framework.

This study contributes to the current literature by using qualitative parameters that have not been considered in previous studies on prioritisation of RPA projects. By quantifying qualitative parameters, prioritisation becomes more robust, and projects are chosen with more significant evidence.

In this study, 14 parameters were found that can assist in determining the suitability of processes in relation to RPA. These 14 parameters were found by comparing current studies' automation criteria, priority parameters and using empirical data from both Skatteforvaltningen and LEO Pharma. By utilising both case organisations to collect empirical data, a greater opportunity for collecting data is obtained. Since the organisations are distinct, various data are collected, which has resulted in multiple parameters. Not all of them necessarily fit a particular

organisation. *Legislation Pressure* was an area that Skatteforvaltningen reasons were fundamental while LEO Pharma thought that this parameter was of low importance.

Furthermore, this study contributes by having 14 parameters to be considered when prioritising robot projects, where previous literature does not have as many parameters or only inherently quantitative ones. We consider these parameters to be essential, and thus all are important, though not equally important, why they have separate weighting.

Documentation quality is a discussed topic in the literature, and the importance of this parameter is discussed among the leading professors in prioritising RPA projects. Geyer-Klingeberg et al. (2018) considers this parameter to be essential for the robot to perform the right tasks without fail, while Cewe et al. (2017) disagrees, as he believes that RPA helps to design new and improved processes. In this study, both organisations agree with Geyer-Klingeberg et al. (2018), and consider this parameter important. This is caused by both companies having a problem-based approach to developing robots. Neither LEO Pharma nor Skatteforvaltningen has a strategy to create new and innovative processes with the help of RPA. Both organisations use RPA to automate current processes.

7.3.2 Implications for IT governance

The underlying choices of the artefact is formed by following some of the basic concepts from IT governance. It can be challenging to argue what implications our framework has had on the literature presented in Chapter 2, since it would require a closer study on an organisation attempting to implement or adopt the framework. However, Cater-Steel, Toleman, and Tan (2006) argues that best practice IT standards can be difficult to adopt as they are often either very complex or lacks a clearly defined method to implement. We have sought to produce a framework with a focus on the use of local expert knowledge. This could potentially reduce the risk of an unsuccessful implementation, as scholars highlight the lack of internal skills as a significant risk in the implementation. Additionally, several informants have expressed satisfaction with the simplicity of the framework, which also contributes to a smoother implementation or adoption.

The principal purpose of our framework is to indicate which processes are more important than others. Something ITIL has often been criticised for, by not being

efficient enough in distinguishing between "nice-to-have" features and features that generate the value. The framework, in particular, complements the literature on realising IT benefits by aiming to clarify where an organisation maximises the value from RPA. Since RPA is still in a quite early stage in most organisations, perhaps the most apparent supplement is in the problem-based view. In this view, Peppard et al. (2007) mostly defines some areas that organisations should be aware of when implementing technology. Out framework aims to clarify how we can achieve these benefits through the best possible method, without spending unnecessary resources.

7.3.3 Implications for the decision structure literature

Overall, the concept of decision theory was somewhat in agreement with the empirical evidence and turned out useful for the final artefact.

Some challenges were found in the discussion of the Analytical Hierarchy Process (AHP) framework that laid the foundation for our framework. Several of the shortcomings of AHP have been pointed out by several scholars already (Smith & Von Winterfeldt, 2004; Harker & Vargas, 1990; Klein & Beck, 1987). One of the key agreements between the scholars is that AHP does not solve the challenge regarding the need for numbers higher than the scale allows. Our empirical evidence proposes mixing the general nature of decision making through non-limited numbers with AHP, therefore minimising the number of cases in which this issue occurs. This can be seen, e.g. in the cost-calculator in the artefact, that converts standard numbers into a grade that can be used by AHP.

Moreover, we sought to understand the actual utilisation of data in the decision-making process. We found that multiple actors in the case organisations believe that data can and will be manipulated by the actors, to ensure that they either work on things that they find exciting or to work for the better of their sub-organisation instead of the organisation as a whole. This is in line with the current decision theory, by Kelly (2003), who suggests that decision theory often resembles game theory. Our empirical evidence and subsequent unification of AHP and decision theory are somewhat bridging the gap between the pure-data theory of AHP with the game theory of communicative rationality.

Our results on exploring the relationship between efficiency of RPA resources and the degree of decentralisation led to some rather interesting conclusions. We

observed that both of the case organisations could benefit by striving towards a more centralised governance model, as the current usage of developers often proved to be somewhat wasted on less efficient projects, seen from the organisational perspective, as the developers were often bound to their departments, instead of working from a centralised backlog that considered the entire organisation. This finding can be considered reasonably contradictory to the relevant literature (Zabojnik, 2002; Carter & Cullen, 1984; Procter et al., 1999). In agreement with the decision theory, we do acknowledge that in the rating process, both organisations could enhance the usage of knowledge by decentralising the rating of parameters and empowering the employees (Van Marrewijk, 2007).

We did find that the challenges faced in public versus the private sectors are in some cases in agreement with the current theory outlined by Seabright (1996) and Tommasi and Weinschelbaum (2007). We see that the public sector is focused on the legislative branch of their organisation and often prioritise those projects higher than others, without questioning the business case. This is often done to ensure transparency and proper alignment with public management. The private organisations had an extreme focus on economic benefits from RPA, which is also in agreement with the theory.

We did not find other parts of the public versus the private sector literature foundation as fitting to our results as the above.

7.4 Study Limitations

This section reflects on some of the limitations of the research that readers should be aware of before using the findings in their respective ways. During the interviews in the final iteration, some of the parameters could be interpreted in different ways. This could potentially have had a negative effect on the weight, making the final weight misleading. One of those parameters was *Customer Satisfaction*, where some informants interpreted the internal customer satisfaction as being the ones working directly with the process being automated. These informants rated the parameter quite low as they assumed that the employees desiring their process to be automated would be satisfied as a given. Instead, internal customer satisfaction should have been interpreted as employees being affected indirectly when the process is automated. For example, if a manager needs to hire a new employee, his satisfaction would be increased as the hiring process would become a lot faster when it was automated. This parameter could have

been explained in greater detail before the final interviews, to make the weight of the parameter more accurate.

Another parameter was the *Documentation Quality*. Some informants initially interpreted it as the documentation that would have to be made during and after the development of a robot. It was made clear to them that it was the existing documentation quality that was relevant for the parameter, but it can not be excluded that the initial confusion on the interpretation can have adversely effected the final weights.

Finally, there was some ambiguity about the difference between the *Internal Prioritisation* and the *Organisational Vision*. As the *Internal Prioritisation* was discussed first, some of the respondents only became aware of their misinterpretation as they were presented with the *Organisational Vision*. Their weight of the parameter was changed after they were made aware of the misinterpretation, but once again, it may have affected their answer. Some of these challenges could have been avoided by explained each parameter in more detail before initiating the interview, but due to time limits, the risk of misinterpretations was less harmful than not having the opportunity to examine all the parameters.

Another study limitation is the fact that all the respondents did not weight every parameter. This was either due to lack of time when interviewing higher-level managers or because they did not have the appropriate knowledge to make an accurate estimate. This makes some of the parameters less accurate as it makes the sample size of those parameters smaller.

The sample size, in general, was minimal as it only includes ten respondents. This makes the potential to generalise a framework like this very difficult. Readers should be careful implementing this framework solely based on our findings, as the weight of the parameters potentially could be very different in their particular regards. However, the fact that the framework creates a foundation for discussion in the prioritisation and not presents the truth still makes it applicable in a broader context. Moreover, by replicating our methods for obtaining the weights and parameters, future scholars and organisations are able to build on our model.

Additionally, the sample profiles might also have impacted the results in the final prototype. Some of the respondents might have been more suited to answer how vital some parameters were than others. For some, it might even have been easier to understand the parameters the correct way and reflect on how they are essential in their organisation. We attempted to avoid this misunderstanding by giving them the option to skip some parameters if they did not possess the

appropriate knowledge. However, most respondents did weight all the parameters, and one might argue that it is unlikely that one employee possesses the necessary knowledge to give a satisfying estimate on all of them.

Another limitation is the normalisation of the response data. It is not clear how a respondent interprets the importance of a parameter when estimating it on a scale from one to ten. Some might have weighted a parameter as a six but in their mind attributing it as much importance as another one weighting it as an eight. A better job could have been done in labelling the score as it is seen in many traditional surveys.

Readers also have to be aware that the research has been conducted on two organisations at different stages in their RPA lifespan. Multiple respondents mentioned that their view on what would be an essential parameter for their organisation could be quite different in some years when they have gained more maturity in the area of RPA.

As mentioned in Chapter 3, the situation with COVID-19 has had some effects on the research as a whole. The limitation above has not been caused by COVID-19 alone, but this potentially had an amplifying effect on the research limitations.

7.5 Future Research

During this section, we wish to discuss five proposals for future research, which we consider promising for understanding and improving the relationship between decision making and RPA.

First, by including more data and expand the number of sectors and organisations, the data in the model would be more generalisable. Currently, the model is built with a limited set of data-points, and several of the informants answered very differently to the same questions. Moreover, we will propose to understand how a different maturity level in the organisation can change the model.

Second, we propose looking into grouping development projects into systems that are complementary to each other. The current system is only capable of rating each proposal individually, but often some symbiotic effects can be found by bundling projects. During this thesis, some informants have expressed this need e.g. in Section 5.2.1 and Appendix H.

Third, we are proposing that future research should apply machine learning algorithms in a feedback loop for the system. We are thereby allowing the users of the system to enter feedback following the conclusion of a project, which will subsequently change the weights of all other projects, based on the learnings from previous projects.

Fourth, we are proposing developing an action research approach to understand the challenges of implementing the proposed artefact in the organisations. Future scholars should be aware that action research based on innovative systems are often prone to failure due to organisational and technological maturity.

Fifth, we propose a development of a vertical prototype exploring the relationship between the parameters. We suggest conducting the study on a considerably large backlog, to understand the overview of the artefact as well as the actual usage of the framework.

Chapter 8

Conclusion

The role of selecting the correct processes for automation-technologies, and more specifically, Robotic Process Automation, have received little attention from scholars. Multiple organisations have already begun automating processes, but selecting the appropriate process is critical to create value and succeed in automation. Moreover, the usage of structured process selection systems such as AHP has not been tailored to RPA yet, forcing organisations to build their own knowledge-base and selection systems, with varying quality.

To further understand the challenges and solutions, we sought to investigate our research questions related to designing a structured RPA backlog. To conduct this research, we combined the three different concepts of Automation, IT Governance and Decision Structure with the Design Science Research methodology to produce an artefact to assess a process' suitability for automation. We drew upon qualitative and quantitative data collected from three different organisations, which includes a consulting company as well as two case organisations working in different industries and with varying models of governance. The two distinct case organisations allowed us to design the model for broader application.

The design of the artefact has been conducted through three iterations. Initially, we sought to understand the current challenges for selecting processes for automation. Secondly, we aimed to answer each of the research questions as well as assess the usability and relevance of the artefact.

Our overall research question aimed to understand the current structure of the backlog in our case organisations in order to change and rebuild a more optimised prioritisation framework. Based on the analysis of the relevant literature as well as the empirical inputs, we designed the artefact, with the following five principles:

1) centralised decision structure
2) comparability across all processes
3) transparency by design
4) maximising the value of automation
5) optimised use of local knowledge
The structured framework was successfully adapted to both organisations and laid the framework for assessing and evaluate each considered project.

For the first sub-research question, we sought to understand which parameters should be used to assess the automatability of a given process. The fourteen parameters that we found have been based on the existing literature as well as the multiple empirical iterations. During the iterations, we further developed a model to weigh the different parameters with each other. This laid the foundation for an analytical hierarchical process model, that successfully translates each process into a final grade.

The second sub-research question aimed to answer how a prototype to assess requirements for RPA could be outlined. Based on the parameters discovered through the second research question and the design science approach, we have sketched and outlined an artefact to assess the important criteria when prioritising RPA projects.

The third sub-research question evaluated the challenges and opportunities in implementing the process prioritisation artefact that we designed across different types of organisations. Adopting best practice IT standards can often be difficult, and this framework, in particular, includes some challenges defining the appropriate roles in the organisation as they might differ. Furthermore, readers are suggested to be aware of their maturity in the fields of RPA, as such framework possibly needs alteration as the maturity increases.

RPA represents a new IT Development paradigm, as it empowers organisations to automate tasks and processes across a wide variety of applications, that were not able to easily automate before the emergence of this technology. To garner the benefits of RPA, it is necessary for organisations to assess the relevant processes, for maximising the potential for automation. Our study has clear, practical implications that suggest a structured decision system for exploiting the value of RPA. The case organisations have expressed that by adopting the proposed artefact, they could significantly increase the value of Robotic Process Automation.

Chapter 9

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Chapter 10

Appendices

Description of Document	Appendix	Location
1. iteration | Tina, Chief consultant, Skatteforvaltningen	**A**	./Interviews/*
1. iteration | Carsten, Lead developer, Skatteforvaltningen	**B**	./Interviews/*
1. iteration | Richo & Murssal, DigiPof, Skatteforvaltningen	**C**	./Interviews/*
1. iteration | Jesper, HR Developer, LEO Pharma	**D**	./Interviews/*
1. iteration | Manos, HR Process employee, LEO Pharma	**E**	./Interviews/*
1. iteration | Johnny, HR Director, LEO Pharma	**F**	./Interviews/*
1. iteration | Jens, R&D Chief, LEO Pharma	**G**	./Interviews/*
2. iteration | Mikael, RPA Consultant, KPMG	**H**	./Interviews/*
2. iteration | Kristoffer, RPA Consultant, KPMG	**I**	./Interviews/*
3. iteration | Tina, Chief consultant, Skatteforvaltningen	**J**	./Interviews/*
3. iteration | Carsten, Lead developer, Skatteforvaltningen	**K**	./Interviews/*
3. iteration | Richo & Murssal, DigiPof, Skatteforvaltningen	**L**	./Interviews/*
3. iteration | Jesper, HR Developer, LEO Pharma	**M**	./Interviews/*
3. iteration | Johnny & Manos, HR Director & Proces, LEO Pharma	**N**	./Interviews/*
3. iteration | Jens, R&D Chief, LEO Pharma	**O**	./Interviews/*
Interview guide	**P**	./Other/*
Overview of weights	**Q**	./Other/*
LEO Pharma prioritisation sheet	**R**	./Case Org. Data/*
LEO Pharma process mapping for automation	**S**	./Case Org. Data/*
LEO Pharma RPA pipeline workshop template	**T**	./Case Org. Data/*
Skatteforvaltningen RPA Deliverymodel	**U**	./Case Org. Data/*
Skatteforvaltningen Processdescription example	**V**	./Case Org. Data/*
Table 10.2	**W**	Page 159
Table 10.3	**X**	Page 160
Table 10.4	**Y**	Page 161

TABLE 10.1: Overview of all our appendicies.

Please note that A to T can be found in the supplied .zip file.

Parameter	KPMG	SKAT	LEO	SKAT+KPMG	LEO+KPMG	Overall average
Reusable Modules	5.5	4.6	6.5	4.9	6.0	5.3
Workload	7.5	5.9	6.0	6.4	6.8	6.3
Process Maturity	8.0	7.0	7.0	7.3	7.5	7.3
Internal Prioritization	3.0	7.8	7.4	6.2	5.9	6.7
Risk Evaluation	6.0	7.8	8.0	7.2	7.3	7.5
Organizational Vision	5.5	7.8	6.0	7.0	5.8	6.6
System Count	9.5	5.3	6.0	7.4	7.8	6.9
System Complexity	9.0	5.0	6.5	7.0	7.8	6.8
Documentation Quality	5.5	6.6	9.0	6.3	7.3	6.9
Clicks and Interactions	8.5	5.3	3.0	6.9	5.8	5.6
Legislation Pressure	5.5	9.3	5.8	8.0	5.7	7.1
Customer Satisfaction	7.0	4.6	7.5	5.4	7.3	5.9
Time usage	10.0	6.3	9.8	7.5	9.8	8.4
Amount of Transactions	10.0	7.0	9.8	8.0	9.8	8.7
Gennemsnit	7.2	6.4	7.0	6.8	7.2	6.9

TABLE 10.2: Calculation of average score from respondents

Overall average indicates the final weight used in the design of the final prototype

Parameter	LEO v. SKAT	SKAT v. KPMG	LEO v. KPMG	KPSK v. KPLE
Reusable Modules	1.9	0.9	1.0	1.1
Workload	0.1	1.6	1.5	0.3
Process Maturity	0.0	1.0	1.0	0.2
Internal Prioritization	0.4	4.8	4.4	0.3
Risk Evaluation	0.3	1.8	2.0	0.2
Organizational Vision	1.8	2.3	0.5	1.2
System Count	0.8	4.3	3.5	0.4
System Complexity	1.5	4.0	2.5	0.8
Documentation Quality	2.4	1.1	3.5	1.0
Clicks and Interactions	2.3	3.3	5.5	1.1
Legislation Pressure	3.5	3.8	0.3	2.3
Customer Satisfaction	2.9	2.4	0.5	1.8
Time usage	3.5	3.8	0.3	2.3
Amount of Transactions	2.8	3.0	0.3	1.8
Gennemsnit	1.70536	2.7	1.9	1.05

TABLE 10.3: Differences: LEO Pharma, Skatteforvaltningen and KPMG.

In the final column KPSK is a contraction of KPMG and Skatteforvaltningen. KPLE is a contraction of KPMG and LEO Pharma. In this calculation the answers from KPMG has been used to normalise the weights from both Skatteforveltningen and LEO Pharma

Parameter	SKAT	LEO	KPMG	SAMLET
Reusable Modules	3.92	0.25	6.25	4.18
Workload	2.92	1.00	6.25	3.75
Process Maturity	0.88	9.00	0.00	2.88
Internal Prioritization	0.69	0.92	0.00	4.00
Risk Evaluation	3.69	4.50	1.00	4.05
Organizational Vision	5.19	16.50	6.25	10.84
System Count	5.06	0.00	0.25	5.20
System Complexity	1.00	2.25	1.00	4.14
Documentation Quality	9.17	0.00	6.25	7.78
Clicks and Interactions	0.56	0.00	2.25	6.03
Legislation Pressure	0.69	3.69	20.25	8.89
Customer Satisfaction	0.92	0.25	4.00	3.28
Time usage	3.69	0.19	0.00	4.64
Amount of Transactions	2.00	0.19	0.00	2.81
Gennemsnit	2.88	2.77	3.84	5.18

TABLE 10.4: Variance from the weight results