The Sisyphean Climb
Quantifying Robotic Process Automation with Agile Methodologies

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Abstract

This study explores the integral stages involved in the implementation of Robotic Process Automation within organizations, drawing parallels with established practices in software engineering, particularly the Agile methodology. Much like Sisyphus eternally pushing his boulder uphill, the continuous nature of business development requires ongoing effort and constant adaptation. However, unlike Sisyphus, businesses have the opportunity to strategically leverage tools like Robotic Process Automation to make the climb more manageable. This study looks at a handful of organizations in the Uppsala region, using interviews, alongside a literature review on related topics such as Robotic Process Automation, Software engineering methodology’s, particularly Agile, as well as classically used evaluation strategies, such as Return of investment, Cost benefit analysis, and Multi-criteria analysis, to identify three instrumental stages, Identification, Prioritization, and Evaluation, in the development process of Robotic process automation.

The report also highlights the significant influence of an organization’s maturity in the usage of Robotic Process Automation on the success of its automation projects. These findings underline the need for comprehensive awareness and understanding of Robotic Process Automation across various organizational departments, similar to the principle of stakeholder engagement in Agile development.

The prioritization of processes for automation is shown to be guided by factors such as the potential business impact, feasibility, and expected long-term benefits. This observation aligns with Agile’s emphasis on efficient resource allocation and alignment with broader business objectives. However, in the later stage of RPA development referred to in this report as the “evaluation stage”, the study uncovered a low level of quantitative data collection following implementation, with a greater focus on qualitative benefits.

These findings suggest potential areas for future research, including the development of structured prioritization frameworks and methods for collecting qualitative data. The study concludes by suggesting that methodologies from software development, such as Agile, could be effectively applied to improve the implementation of Robotic Process Automation.
2 Preface

I would like to express my gratitude to all the participants who contributed to this study. Particular acknowledgments are extended to the following individuals, who have graciously granted permission to be mentioned: Mats from Läkemedelsverket Sweden, Saam from Uppsala Kommun, and Mikael from Region Uppsala. Furthermore, I extend my sincere appreciation to Atea Uppsala, with special recognition to Joanna Nordlund for her unwavering patience and invaluable support throughout the process.
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3 Glossary

- **Multi-attribute utility theory (MAUT)** is a decision-making framework that allows decision-makers to evaluate and compare options based on multiple attributes or criteria. MAUT involves assigning weights to the attributes based on their relative importance, and then scoring each option against each attribute. The results are used to calculate a utility score for each option. This theory was founded by von Neumann and Morgenstern[16], as well as Savage[13], in the 1940s and 1950s.

- **Multi-criteria analysis (MCA)** is a decision-making tool that allows for the evaluation of multiple criteria in order to reach a decision or make a recommendation. MCA can be used in conjunction with MAUT and is often used when there are multiple criteria that need to be considered.

- **Artificial Intelligence (AI)** or machine intelligence are programs that imitate human thinking; the applied science that discusses what is human thinking and tries to imitate it or develop something equivalent or better with computer programs[7].

- **Robotic Process Automation (RPA)** is a technology that enables the automation of repetitive, rule-based tasks that were previously performed by humans[15]. RPA uses software robots or “bots” to execute tasks by mimicking the actions of a human worker interacting with a computer system.

- **Cost-benefit analysis (CBA)** is a decision-making tool used for evaluation of potential benefits and costs of a project or investment.

- **Return on Investment (ROI)** is a calculation of the monetary value of an investment versus its cost. \((profit - cost)/cost\)

- **Agile** is a software engineering strategy for development and maintenance.

- **Process** a description of how a task is to be conducted step by step. Used by companies to enforce standards and uniformity.

- **Connectivity** is the degree that something is connected. How well integrated systems is with each other.

- **Push and Pull** in the context of an object or solution, “push and pull” refers to conflicting forces or factors that can either encourage or discourage the adoption or use of that object or solution.
4 Introduction

Robotic Process Automation (RPA) is a rapidly growing field in the world of business, offering a solution to the problem of repetitive, time-consuming tasks that are essential, but not necessarily engaging for human employees. RPA solutions, similar to the Agile methodology in software engineering, in many cases also promises to reduce lead time in case management and reduce stress for employees. RPA refers to the process of using a virtual robot, to perform predefined tasks for the user much like a macro would, but can be programmed to do more advanced tasks, such as making decisions based on input data, and using predefined decision trees, leveraging [if, then, else] statements, allowing for multiple outcomes and flexibility. Using these decision trees RPA can perform certain tasks more quickly and accurately than humans, freeing up time and resources for more complex and creative work.

The focus of this report is to explore the factors that contribute to the perceived benefit of RPA implementations, and to present information that might act as a guide for implementing RPA solution. Specifically, the aim is to identify and quantify factors in the development that might be impactful to a RPA implementations success. This report will look specifically at the parallels that can be drawn with the agile methodology from software engineering, what role an organisation’s RPA maturity has, what the role of the process practitioners is, as well as look at the tools being used today for identification, prioritization and evaluation of RPA implementations.

Although there are existing tools for conducting classical analysis of implementations, such as cost-benefit analysis (CBA), or Return on Investment (ROI), they often rely on fixed models that might not coincide with what is viable business practices. The goal of this report is to look at what might constitute viable business strategies in today’s climate, using companies in different stages of their software development loop, and to identify critical factors for successful adaptation within each. By doing so, the intention is to provide businesses with a guidelines to make better-informed decisions regarding the implementation of RPA solutions and a basis for starting to prioritise what processes might be eligible for RPA, as well as what metrics to look at when evaluating their own implementations. The work builds on previous research in the field of multi-criteria analysis (MCA), including the guidance provided in [9], as well as draws upon the insights presented in the article [15]. The report also draws parallels to development strategies in software engineering, specifically the Agile methodology. The main source of information comes from interviews with companies and organisations that have been successful in implementing RPA solutions to varying degree and with different goals in mind.

To achieve this, a comprehensive literature review of previous research on Robotic Process Automation, cost-benefit analysis, Multi-criteria analysis, the Agile methodology, and optimization models was conducted, leading to the development of guidelines presented in the result section, for quantifying the various factors that contribute to the perceived return of RPA implementations. By doing so, the hope is to contribute to the growing body of knowledge on RPA and help businesses make better-informed decisions about their automation strategies, as well as prioritization of proposed implementations during the analysis phase.
5 Background

This section explains the context of the report, discussing the problem area and the precise formulation of the issue. It also addresses the limitations of the study, identifies the key stakeholders, and outlines the research approach and method.

5.1 Problem area, and formulation

This report aims to examine how principles of Agile software development can be utilized in conjunction with dynamic guidelines for identifying, prioritizing, and evaluating Robotic Process Automation (RPA) implementations. It also looks into the role of the process practitioners, and what role the organizational RPA maturity has in successful RPA implementations. The study evaluates the effectiveness of the current prioritization structures in the selection processes for RPA implementations. It also explores the most appropriate strategies and metrics for their evaluation. To answer these questions, this report will explore the factors that contribute to the success of RPA implementations, through a literature review of previous research on RPA, cost-benefit analysis, Multi-criteria analysis, and optimization models, as well as analysis of qualitative data, collected from companies, government and organisations in Uppsala using RPA in their daily operation.

5.2 Limitations of the study

The study has several limitations. First, time constraints impacted data collection as the study was conducted over a 10-week period without associated funds. Due to General Data Protection Regulation (GDPR) limitations, the collection of quantitative data beyond that obtained during the interviews was not possible. Additionally, the study’s scope was limited to a few organizations and companies in Uppsala, and only clients who were actively working to maintain and automate new processes were included. Since the respondents was in different stages of their RPA development their motivators are different, and the sample size is small from each stage. To set a baseline, requirements for participation in the study was generated. The preconditions for an organisation, and respondent within that organisation are as follows.

- The organisation has at least 5 processes that has been automated using RPA.
- The organisation is actively looking for new processes to automate using RPA.
- The organisation is willing to conform to the requirements in regards to interviews stated in the interview questions.
- The respondent has worked with, or around RPA for a minimum of 1 year.

The reason for these requirements are as follows. In order to have thought about RPA in a mature way, the organisation should have some ideas on what processes are suited for automation. Specifically five processes, although arbitrary, also entails some experience in the maintenance of already implemented RPA solutions and offer insight in the metrics important to the success of an implementation. If the organisation is actively looking for new processes to automate, it implies that they have to some degree found success or benefit in their implementations, and hopefully is using some kind of evaluation/analysis of their active processes to find new candidates. These limitations should be considered when interpreting the results of the study.
5.3 Stakeholders

The stakeholders encompass organizations, enterprises, and governmental entities that are contemplating the adoption of Robotic Process Automation (RPA) for streamlining their operational processes. Since some of the correspondents are organizations focused on societal gain rather than monetary profit, the evaluation techniques discussed might cater more towards those with societal gain as the main motivator. Nonetheless, it can be argued that the emphasis on efficiency, in the context of selecting one solution over another, suggests that this factor may be of lesser importance. Secondary stakeholders are companies that provide consulting in regards to RPA implementations, since it might aid in proving a RPA implementations worth to a potential client.

5.4 Research Approach

To answer the questions posed in this report the following research methodology will be applied:

**Qualitative Data and Case Studies:** Empirically repeatable interviews will be conducted with RPA practitioners in the public domain. These interviews aim to capture firsthand experiences, challenges, and successes in RPA implementations. RPA practitioners from organizations in Uppsala, including both companies and government entities that utilize RPA in their daily operations, will be the focus of case studies. These studies are designed to offer real-world examples and provide a deeper understanding of the practical aspects of RPA applications.

**Literature Review:** A comprehensive literature review will be conducted to explore previous research on RPA, including best practices, success factors, and challenges associated with RPA implementations. The literature review will provide a theoretical foundation for the research and help identify relevant factors for analysis.

**Analysis of Qualitative Data:** The qualitative data obtained from interviews will be analyzed to identify common themes, challenges, and opportunities in RPA implementations. The analysis will provide insights into the factors that contribute to the success or failure of RPA implementations.

By employing these research methodologies, this report aims to address the research questions and provide a comprehensive understanding of how principles of Agile software development can be utilized with dynamic guidelines to identify, prioritize, and evaluate RPA implementations. It also looks to assess the effectiveness of existing prioritization structures and propose strategies and metrics for their evaluation.
6 Related work

In this section, a look at the current research and developments is provided as a context and groundwork for our study. The exploration of these related works offers a broader understanding of the current state of the field and lays the groundwork for the result section.

6.1 Robotic process automation

Robotic process Automation (RPA) is a umbrella term for automation tools designed to operate on the user interface of other programs, this differs from other automation, and workflow solutions in that the system that the RPA solution operates on needs not to be modified in any way. There is an array of different RPA providers such as Blue Prism, UiPath, EdgeVerve, Kofax, and Nice, but uniformly true is their utility is the same. Gartner defines RPA as follows, “RPA tools perform [if, then, else] statements on structured data, typically using a combination of user interface interactions, or by connecting to APIs to drive client servers, mainframes or HTML code. An RPA tool operates by mapping a process in the RPA tool language for the software robot to follow, with run time allocated to execute the script by a control dashboard” [14].

To narrow down the area where RPA implementations might be most valuable, we might look at [15]. Where the concept of the long tail of work, that refers to the phenomenon in which a large portion of work or economic activity is generated by a vast number of small, niche or specialized tasks, rather than a small number of dominant, mainstream tasks. This concept is based on the observation that, in many industries and fields, the majority of output or revenue is generated by a large number of niche products, services or activities, rather than a few popular ones. In [15] it is proposed that there exists three distinct categories of processes as can be seen in Figure 1. In the realm of process automation, a specialized application of the Pareto principle highlights the significance of the middle section of processes. While the 80/20 rule traditionally emphasizes that 80% of effects come from 20% of the causes, in RPA, the middle segment of processes—neither the most frequent nor the rare outliers—often holds the greatest potential for time savings and efficiency gains[1]. Automating these processes can provide the most substantial return on investment, as they tend to be frequent enough to benefit from automation but aren’t always the primary focus of traditional optimization efforts.
Figure 1: Pareto distribution
6.2 Software engineering and RPA

The classical Software engineering (SE) is a systematic and disciplined approach to designing, developing, maintaining, and managing software systems[5]. Development methodologies in software engineering, including Waterfall, Agile, and DevOps, represent structured frameworks used to manage and streamline the process of software creation. Waterfall uses a sequential design approach, Agile encourages flexible and collaborative development, while DevOps merges software development with IT operations to enhance collaboration and productivity. They all involve the application of engineering principles and practices to create efficient, reliable, and scaleable software solutions that meet the needs of users and organizations[5]. Agile has become increasingly popular during the 21st century as many in the field prefer the benefits provided by Agile as oppose to the ones in Waterfall model[2]. At the heart of Agile methodologies is the iterative and incremental development loop known as a sprint. These sprints are short, time-boxed iterations typically lasting between one and four weeks. Each sprint involves a complete development cycle, as seen in Figure 2.

![Software Engineering Loop](image)

Figure 2: Software Engineering Loop

When it comes to Robotic Process Automation (RPA) development, the Agile framework might offers a dynamic blueprint for the effective execution of RPA initiatives as per Section 7. Agile's
emphasis on iterative development, collaboration, and responsiveness to evaluation might prove to be a framework for developing, testing, and deploying RPA bots in an efficient and effective manner. Additionally Agile’s collaborative spirit promotes interaction among stakeholders, RPA developers, and end-users throughout the RPA development process. This not only encourages shared understanding and ownership of the RPA solution but also accelerates issue resolution and adaptation. To create a bridge between RPA and Agile development, this report introduces three foundational stages specific to RPA development: Identification, Prioritization, and Evaluation. As detailed in Section 7, these stages mirror the integral phases of SE, emphasizing their significance as an foundation for questioning and establishing a connection between Agile software engineering practices and RPA implementation.

6.3 Classical evaluation models

This section aims to explore some of the models historically used for analysis of software implementations and specifically focusing on their potential applicability and usefulness in the context of RPA.

6.3.1 Cost benefit analysis

Cost-benefit analysis (CBA) is a widely recognized technique employed in the decision-making process to evaluate the viability and economic efficacy of projects, including the implementation of RPA solutions. The main technique applied is systematic comparison of the total cost associated with an investment or implementation (RPA), against a total benefit that the investment or implementation is expected to generate [4].

When applied to RPA, CBA, if done thoroughly allows an organisation to determine whether the benefits outweigh the cost associated with a implementation [10], as well as helps organizations to make informed decisions regarding the prioritization and selection of processes for automation [3]. CBA usually involves looking at factors such as software acquisition, licensing, and maintenance, error handling, as well as personnel training [11]. Then the potential benefits are quantified, some of which might be, improved efficiency, increased accuracy, reduced human errors, and higher employee satisfaction due to a reduction in repetitive tasks [3]. Finally, net present value (NPV) of the RPA solution is calculated by subtracting the total discounted costs from the total discounted benefits, where a positive value indicates a RPA solution is viable and can be expected to generate a net gain for the organisation.

Quantifying all the costs and benefits associated with an RPA solution can be challenging, due to the complexity of larger organisations, and the multifaceted nature of automation implementations, especially in RPA. While some value such as software acquisition, licensing, and maintenance expenses, oftentimes might be possible to estimate accurately in terms of monetary gain, others such as personnel reassignment, employee happiness, or morale might be intangible or difficult to translate to a monetary value. These intangible benefits could have a substantial impact on the overall productivity and competitiveness of an organization [3]. Furthermore we can see in Section 7 that motivators for RPA might not necessarily be solely monetary gains, depending on what phase a organisation finds itself in. As a result, while cost-benefit analysis provides
valuable insights into the potential economic viability of RPA solutions, it may not capture the full range of costs and benefits, and thus potentially underestimating or overestimating the true value of implementing automation in a given context.

6.3.2 Return of Investment (ROI)

Return on Investment (ROI) is a widely used performance metric that evaluates the financial efficiency of an investment by comparing the net profit generated to the initial investment cost. In the context of RPA, ROI is employed to measure financial aspects of a project, it could be used to justify allocation of resources for further RPA solutions[10].

While ROI can provide valuable insights in the financial performance of a particular RPA implementation, and can be easy to apply, again, as with CBA, it might not be the optimal solution when taking into account "soft" or hard to measure values. Furthermore, ROI calculations may not adequately capture the long-term strategic value of RPA implementations, as it generally emphasizes short-term financial gains. It can also lead to organisations focusing on short term financial gains rather then long term sustainable growth[11]. The respondents in this report used ROI sparingly as will be prominent in the result presented in Section 7. In summary, while ROI can be a useful metric for evaluating the financial efficiency of RPA implementations, it may not fully capture the complete range of costs and benefits associated with automation.
Multi criteria analysis

Multi-criteria analysis (MCA) is a decision-making approach that considers multiple criteria when assessing the suitability or desirability of various alternatives\[12, 6\]. It is a subdomain of Multi-attribute Decision Making (MADM), which is an umbrella term for an array of Multi attribute decision-making techniques. In contrast to the single-criterion methods such as ROI and cost-benefit analysis, MCA takes into account both quantitative and qualitative factors, as well as the various stakeholders preferences and priorities. The result is a more holistic evaluation, as it considers multiple dimension, potentially making it a more suitable evaluation strategy for complex scenarios, as often times is the case when dealing with efficiency improvement such as RPA implementations. RPA projects often involve trade-offs pertaining to different goals, such as cost reduction, efficiency improvement, and employee satisfaction. By using MCA, evaluators can incorporate a wide array of criteria into their decisions, including both tangible financial instruments such as ROI, and intangibles such as employee happiness.

MCA generally consists of several steps:

- **Define the problem and objectives**: Identify a problem and what objectives for solutions there are. In cases where RPA might prove a solution, improving the efficiency of a business process or relieving a department or work group to some satisfactory degree usually is the objective\[12\].

- **Identify alternatives**: List all feasible alternatives that can potentially address the problem. For processes, it involves overlooking the tools available and picking promising candidates. RPA might be one such candidate, if business development, or process efficiency is a goal\[13\].

- **Establish evaluation criteria**: Identify the criteria that will be used to evaluate and compare the alternatives. It might manifest as a form or a scoring system. The system should cover various dimensions of the problem and reflect the stakeholders’ priorities. Within RPA, it might include cost, ease of implementation, scalability, potential efficiency gains, impact on employee satisfaction, and ROI\[12\].

- **Assign weights to criteria**: Assign weights to the different criteria based on their importance. These weights help to quantify the trade-offs between different criteria. This is an important step as different organizations might prioritize certain traits above others, such as monetary gains for businesses, employee satisfaction to attract competent labour, or handle time in cases of large organizations with a large amount of foot traffic.

- **Evaluate and score alternatives**: Fill in the different criteria. Quantitative scores might involve currency (e.g., SEK, Euros) or values, such as 1-10. They might also be qualitative (e.g., High, Medium, Low).
• **Aggregate scores and do sensitivity analysis:** Sum up the scores using one of several models, most popular is a simple weighted sum. The overall score $A_i$ can be calculated as:

$$A_i = \sum_{j=1}^{m} w_j \cdot s_{ij}$$  \hspace{1cm} (1)

where:

- $A_i$ is the alternative being evaluated ($i = 1, 2, \ldots, n$)
- $w_j$ is the weight assigned to criterion $j$ ($j = 1, 2, \ldots, m$)
- $s_{ij}$ is the score of alternative $i$ against criterion $j$

The alternative with the highest overall score is typically considered the most desirable option. Conduct a sensitivity analysis to assess the impact of changes in criteria weights on the overall ranking. If small changes have a large impact on the overall scoring, the success of an implementation is dependent on the project going according to plan.

• **Select the preferred alternative:** Select a solution to the problem using the insights obtained from previous steps, with the different stakeholders in mind.

• **Implement and monitor:** Implement the RPA solution and continuously monitor its performance against the established criteria. If metrics such as cost, ease of implementation, scalability, potential efficiency gains, impact on employee satisfaction, and ROI are collected in an organized way, the data can be used for further insight into new implementations.

While MCA is a well rounded evaluation strategy that takes into account several important factors in evaluating the perceived benefit, as with any qualitative evaluation, it involves evaluation based on emotions towards some object, or process. and as such can not be guaranteed strictly subjective.
7 Results

This section should be read as the combined results from the interviews, in conjunction with the literature review. This together with the discussion section answers the questions in the problem formulation section.

Interviews were conducted using the questions provided in Appendix 11.1 as a foundation for inquiry. The questions build upon insights attained from consultation with RPA professionals, as well as the academic work [15], [9] and [6] referred to in Section 5. Three primary areas of interest were identified in the study. Identification in the Planning stage, Prioritization during the Analysis stage, and Evaluation throughout the Testing/Integration and Maintenance stages. Looking at Figure 3 for the corresponding areas of interest. These areas of interest are the focus of the inquiries, but allowing for a degree of interpretation and variation while maintaining the focus on the essential aspects of each stage. Citations have been made anonymous due to consistency, and respondents will be referred to as (Respondent X). The X corresponding to some number unique to the respondent.

![Figure 3: Software Engineering Loop with the three primary areas of interest](image-url)
7.1 Identification Stage

Related Questions:

- How far you have come in your work with automation/RPA?
- How would you say that you identify processes that are suitable for automation?
- What factors have been most important for a successful RPA implementation historically?

The respondents feedback points towards that the identification of processes appropriate for automation is largely contingent upon raising awareness and disseminating information about RPA to various units and management groups within the organization. (Respondent 1) "Process practitioners, who possess the day to day experience and intricate knowledge of processes, as well as the good and bad parts of said processes, play a pivotal role in pinpointing potential areas for enhancement." (Respondent 3) "The success of RPA projects is heavily influenced by the organization's level of RPA maturity and comprehension of the tool."

Observations:

- Promotion of RPA tools existence and their associated benefits are crucial for identifying processes suitable for automation, and a key factor in promoting benefits is successful implementations. Several respondents pointed to a completely different attitude towards RPA as process administrators saw successfully implementations. (Respondent 1) "Greater awareness is needed across different departments", (Respondent 2) "Educating management on RPA’s potential is vital").

- The responsibility of identifying processes that can be automated predominantly resides with the process practitioners. (Respondent 4) "Process practitioners are key to finding opportunities for automation" (Respondent 5) "Hands-on experience allows for better understanding of potential improvements"

- The degree of maternity in regards to RPA within an organisation can be have a immense impact on the efficacy of RPA implementations. (Respondent 3) "Organizational RPA maturity plays a significant role in project success" (Respondent 5) "A deep understanding of RPA tools is essential for achieving desired outcomes"

The planning stage in classical software development, especially in the Agile methodology, shares similarities with the identification of processes appropriate for automation in RPA. Both processes involve understanding existing processes, recognizing areas for improvement, and evaluating the feasibility of the proposed solution.

Furthermore parallels between the typical struggles of Software Engineering and Robotic Process Automation can be made. Where identification of automation and business development is hindered by latency in the organisation, push back against modernisation, lack of communication, ignorance to available tools within an organisation, or excessive bureaucracy.
7.2 Prioritization Stage

In the prioritization stage respondents determines which processes to automate first based on factors such as complexity, business impact, and potential benefits.

Related Questions:

- What were your goals with introducing RPA?
- Do you use any model or framework, such as ROI, CBA, or Multi-criteria analysis to analyze your RPA processes before or after implementation?
- In which areas/departments have these automation's been carried out?
- Tell me how you prioritize which RPA solutions should be implemented?
- Do you use any model or framework, such as ROI, CBA, or Multi-criteria analysis to analyze your RPA processes before implementation?

Respondent feedback indicates that there are a few key factors to consider when prioritizing processes for automation. (Respondent 1) "We prioritize processes based on business impact and feasibility." (Respondent 2) "We consider the level of effort required to automate a process, the cost savings that can be achieved, and the impact on customer satisfaction."

Observations:

- Business impact of a process considered for automation is a critical part in determining the priority. Factors included the potential for cost savings, efficiency gains, and improved customer experience as reasons for prioritizing certain processes. Business impact can also manifest as relieving a department of stress, leading to other benefits. This indicates that there is a high connectivity between certain benefits. (Respondent 3) "Processes with the highest business impact are given priority for automation."

- One maybe obvious but often overlooked key factor when prioritizing is feasibility. Some processes may be too complex or require too much effort to automate, while others may be low-hanging fruit that can be automated quickly and easily. Some processes requires large efforts to make it viable as a RPA solution. It is important to identify and sort out unfeasible processes early as to not get invested. (Respondent 4) "We prioritize processes that are feasible to automate with our current RPA tools and resources."

- Long-term benefits should be considered when prioritizing processes for automation. While some processes might offer great ROI. Especially early in the adaptation stage for a organisation the importance of establish a stable of RPA implementations to use as examples within the organisations to demystify and encourage adaptation, and eventually get to a stage where you can prioritize instead of taking what you can get. (Respondent 5) "We prioritize processes that have the potential for scalability and long-term benefits, even if they don’t offer significant cost savings in the short term."

- Collaboration between process practitioners, IT, and the stakeholders is crucial in the prioritization stage. Respondents emphasized the importance of involving multiple parties in the prioritization process to ensure that all factors are considered and informed decisions are made.
made. (Respondent 6) "We involve process practitioners, IT, and business stakeholders in the prioritization process to ensure that we are considering all factors and making informed decisions."

In summary, the analysis stage of Agile methodology and the prioritization stage of RPA share common objectives. In Agile it involves breaking down the project into manageable checkpoints, and making a prioritization based on the user stories, and the functional requirements of the project. Similarly in RPA prioritization involves identifying which processes are most suitable for implementation first, or at all, based on factors such as their complexity, frequency, ROI, resulting in a total business impact. Several respondents use checklists, or evaluation forms where potential benefits can be specified, similar to the methods described in Multi Criteria Analysis, but none of the respondents have very specific or strict structure that could be pointed to. By using Agile in conjunction with RPA, organizations can ensure that their automation efforts are aligned with broader business goals, and that resources are allocated in the most effective way. Additionally the iterative nature of Agile allows for ongoing evaluation and adaptation of priorities, ensuring that automation efforts remain relevant and effective over time.
7.3 Evaluation Stage

The evaluation stage, closely related to the testing/integration and maintenance stage in software engineering.

Related Questions:

- Do you use any model or framework, such as ROI, CBA, or Multi-criteria analysis to analyze your RPA processes before or after implementation?
- If yes, which factors (preferably specifically) are considered in such an analysis?
- Do you collect any data regarding the efficiency of specific RPA solutions after implementation?

Respondent feedback indicates that very little quantitative data is collected after the implementation phase. Some respondents collect data on the number of hours saved or the ROI. Data from one respondent showed 700% ROI on their RPA implementations. The respondent however insisted this was not data he shared openly or used as incentive, but rather pushing the benefits for the process administrators, such as diversification in tasks, less repetitive workload and less stress. Qualitative data is hard to measure, and few methods for such evaluation was specified. But several of the respondents indicated that a majority of the processes they have used RPA to automate or partially automate have been received well. (Respondent 4) “MCA enables a more holistic evaluation of potential RPA implementations”).

Observations:

- Quantitative data collection, post implementation was low. Some respondents measure hours saved, and some ROI, with varying results. Some respondents have seen large percentage gains from implementations, where a key factor in getting good returns is involving the Process Administrators in the identification stage, and making a barrier for entry, forcing the process owners to think about the suitability of RPA.

- Respondents indicate qualitative data collection is done to some degree, with typically good feedback. However rarely under ordered forms. This feedback might come in form of an overall attitude change towards RPA, and increased interest in the tool as people experience its potential. It is possible that reductions in sick-days, and an increase in employee happiness might be a result as well, but no proof of such effects was found.

- Consideration to what benefits to emphasise in presentations in regards to RPA is important. Different stakeholders have different goals and priorities. Management might want to consider both quantitative and qualitative data. While presentations aimed towards employees should focus on the qualitative benefits.

In conclusion evaluation methods like CBA, ROI, and MCA can be instrumental in making informed decisions about automating processes using RPA tools. (Respondent 7) “CBA and ROI help us assess the value of automating a process” Consideration to what benefits to emphasise in presentations in regards to RPA is important. And collection of quantitative and qualitative data in regards to RPA is in general low in the organisations represented by the respondents.
7.4 Other Observations

Humanisation of the robot actually conducting the RPA after it is developed might help to make it more accessible to their coworkers. One respondent said their RPAs, or robots, have all been given their own “real” names such as Allvert, or Alma. It has been a way of assuring the businesses that these are new colleagues who will support and relieve, rather than replace, human employees.” It also might make more accessible to talk about the RPA, and help spread knowledge about its uses.
8 Discussion and Analysis

The results of this study highlight the interplay of several factors in successfully identifying, prioritizing, and evaluating processes suitable for automation via RPA. The importance of raising awareness, disseminating knowledge about RPA, and emphasizing successful implementations to promote a favorable attitude towards RPA across different departments was a recurring theme. This aligns with the Agile methodology’s principle of stakeholder engagement and the need for a collaborative environment.

The findings above correlate well with the problem formulation, as they suggest that Agile principles could indeed be useful in the process of identifying, prioritizing, and evaluating potential RPA implementations. However, the correlation is not as strong as could be hoped for. This is further strengthened by the fact that none of the companies, specifically used Agile as their primary tool for RPA development, but rather picked certain aspects.

In the identification stage, the crucial role of process practitioners emerged, as their in-depth knowledge and experience with daily operations are essential in identifying processes for automation. The importance of raising RPA awareness and fostering a robust understanding of its potential benefits was also highlighted, emphasizing the need for comprehensive internal knowledge dissemination. The level of RPA maturity within an organization significantly impacts the success of RPA projects. However, the methodology used in this study may have introduced some bias, as the data collected from organizations in Uppsala might not be representative of the broader population, or all parts of an organisation, since the study was limited in its size. Furthermore, the reliance on qualitative data and self-reported experiences could have also introduced subjectivity into the results. As a result, some of the nuances in the process practitioner’s role and the impact of an organization’s RPA maturity might have been overstated or understated. Greater RPA maturity not only aids in more effective identification of automation opportunities but also influences their successful execution. The identification stage shares similarities with the planning stage in classical software development, particularly Agile, underscoring the potential benefits of applying software development methodologies to RPA implementation. This result aligns directly with the problem formulation, as it supports the hypothesis that Agile principles could be beneficial in RPA implementations. However, it would have been helpful to provide more concrete evidence or examples to further support this point.

The prioritization stage emphasized the role of business impact, feasibility, long-term benefits, and stakeholder collaboration in making informed decisions about which processes to automate. The alignment of this stage with Agile’s analysis stage underscores the importance of effective resource allocation, alignment with broader business goals, and the ability to adapt priorities over time. Notably, several respondents reported not following strict structures in this stage, suggesting the potential for further investigation into the role of structured prioritization frameworks.

The evaluation stage revealed low levels of quantitative data collection after implementation, with a primary focus on hours saved and ROI. Interestingly, the emphasis was on qualitative benefits for process administrators, including workload diversification and stress reduction. However, few concrete methods for qualitative data collection were mentioned, indicating a potential area for future work. The limited quantitative data collection represent significant limitations in this study.
It is possible that valuable insights or potential challenges were overlooked because of this. In the future, a mixed-methods approach that combines both quantitative and qualitative data might provide a more comprehensive and balanced view of the subject. However this requires the companies to collect said data during and after their implementations.

In conclusion, the successful implementation of RPA in organizations depends on a multifaceted approach, beginning with effective identification of processes, followed by informed prioritization, and finally, a thoughtful evaluation stage. The parallels drawn with Agile methodology suggest that borrowing principles from proven methodologies could enhance the effectiveness of RPA implementation, and in the organisations looked at in the report, a combination of classical development strategies such as Agile and evaluation strategies such as ROI, in combination with the more dynamic evaluation and prioritization aspects of MCA offers a way of quantifying the qualitative aspects of any one process automation.

The result provides a strong correlation with the initial problem formulation, as it suggests that the application of Agile principles could indeed improve RPA implementations. However a notable gap exists in the form of structured prioritization frameworks and qualitative data collection methods, providing avenues for future research. Further studies could also explore the impact of RPA on employee satisfaction and productivity, as well as the potential for RPA to reduce sick days and improve overall employee well-being by collecting data, and doing case studies. Finally, future work could also focus on identifying best practices for communicating the benefits of RPA to different stakeholders, including management and employees.
9  Result based guidelines for RPA development

Robotic Process Automation (RPA) presents significant potential for operational enhancements in various organizational contexts. Its successful implementation, however, is dependant on a methodical and strategic approach. This chapter outlines systematic guidelines for RPA development, encompassing phases from process identification to deployment and iterative refinement. Beyond the technical aspects, the organizational dynamics, such as communication strategies and the humanisation of bots, contribute to the efficacy and acceptance of RPA implementations. This section outlines these facets in detail, providing a structured framework for RPA development in an organizational context. This framework is directly based on the observations made in Section 7.

9.1 Identification

Identification is instrumental in the early stages of RPA development as can be seen in Section 7.1. Initiate with a thorough examination of your company processes. Employ process practitioners for comprehension and outlining workflows. Look at processes with mid size volume, rule-governed, susceptible to mistakes, and consuming considerable effort, these usually reside within the mid section on a Pareto distribution sorted on case frequency such as the one in Figure 1. Processes with structured data inputs are preferable for ease of automation.

9.2 Prioritization and Creation

Prioritization and development strategies, are key factors to success as can be seen in Section 7.2.

1. Prioritization: Adopt a weighted scoring approach to prioritize processes based on criteria like cost benefits, feasibility, investment returns, and strategic alignment.

2. Design: Once the tasks are prioritized, outline the technical prerequisites for each process. Construct a blueprint or flowchart detailing how the RPA bot will interact with various system interfaces to find unfeasible processes early.

3. Development: This encompasses scripting the activities that the bot will execute. Depending on the RPA utility being employed, this might involve programming in a specific language or using a drag-and-drop interface to design the bot's actions. Utilize version control systems to manage modifications and iterations in the bot scripts.

4. Deployment: Once development is finished, deploy the bot to the production environment. Preferably also set up a robust logging system to track the bot's actions and efficacy. Data collection is a prerequisite for evaluation.

9.3 Evaluation and Refinement

Evaluation of implementations as well as refinement to strategies, and method is important as can be seen in Section 7.3.
1. **Evaluation**: Consistently assess the performance and effectiveness of the bot post-implementation. Employ key performance indicators (KPIs) such as time saved, error frequency, return on investment (ROI), and employee satisfaction.

2. **Optimization**: Regularly revisit and optimize the bot's performance based on the feedback accumulated.

3. **Maintenance and Scalability**: Maintain a backlog of issues and enhancements for the bot. Continually revisit this backlog and prioritize elements for future iterations. Ensure your RPA platform can handle increased load as more processes get automated.

4. **Training and Governance**: Establish a governance model to handle change management, ensure compliance, and mitigate risks. Provide periodic training to your teams on RPA utilities, best practices, and changes in processes.

### 9.4 Organisational Development

Organisational Development is not only important, but necessary in all stages of RPA development. It enables and enhance the strengths of RPA as can be seen in Section 7.1, 7.2, and 7.3.

1. **Agile Development**: Adhering to Agile principles in the RPA development process might prove useful. This entails iterative development, frequent testing, and stakeholder involvement at every step.

2. **Information Dissemination and RPA Maturity**: Create awareness and foster a robust understanding of RPA within the organization. The level of RPA maturity significantly impacts the success of RPA projects. Therefore, undertake efforts to increase the organization's RPA maturity, this could involve targeted information campaigns using previous RPA implementations.

3. **Humanization of Bots**: Consider humanizing the RPA bots by giving them "real" names. This can facilitate better acceptance and interaction with the bots within the organization.
10 Conclusion

The study conducts an exploration into Robotic Process Automation (RPA) and its role in modern organizations. A standout observation was the apparent trend of limited quantitative data collection post-implementation, contrasted with a distinct preference for qualitative feedback. The results underscore the connection between the strategies of elevating RPA awareness, distributing knowledge effectively, and fostering a positive organizational stance towards the technology. The report identifies and names 3 critical roles in RPA development and hints at the advantageous incorporation of Agile methodologies into RPA workflows, it also uncovers that most surveyed organizations do not commit solely to Agile. While this study predominantly aligns with and reinforces parts of the current understanding of RPA practices, it also weaves these insights into a cohesive overview. Consequently, it strengthens existing perspectives on RPA without notably broadening the academic discourse.
References


11 Appendix

11.1 Client contact and Questionnaire (Swe)

Information
Intervjuerna kommer utgå från anonymitetsprincipen, Däremot kommer intervjuerna att spelas in om det är okej. Ljudfiler kommer att transkriberas, översättas och sedan kommer ljudfilerna att tas bort när studien är avslutad. Skulle du under intervjun inte vilja svara på något av eller avbryta intervjun är det okej.

Introduktion av informant och studie
1. Vilket företag/Organisation jobbar du för?
2. Vilken roll har du i företaget/Organisationen?
3. Hur länge har du arbetat med det?
4. Vilka är dina huvudsakliga arbetsuppgifter?
   (a) Om RPA är en av dem, hur länge har du jobbat med RPA, och i vilken utsträckning?

Angående RPA
1. Berätta om hur långt ni har kommit i ert arbete med automatisering/RPA.
2. Vad hade ni för mål med att införa RPA?
3. Hur skulle du definiera/beskriva RPA?
4. Hur många processer har ni automatiserat?
5. I vilka områden/avdelningar har dessa automatiseringar utförts?

Analys och utvärdering
1. Jobbar ni aktivt med nya RPA implementationer just nu?
   (a) Om ja, hur skulle du säga att ni identifierar processer som är lämpliga för automatisering
   (b) Berätta om hur ni prioriterar vilka RPA lösningar som skall implementeras?
   (c) Använder ni någon modell eller ramverk, som till exempel ROI, CBA, eller Multi criteria analysis för att analysera era RPA processer innan eller efter implementation?
      i. Om ja, vilka faktorer (gärna specifikt) tas i beaktning vid en sådan analys.
      ii. Beskriv gärna denna process.
2. Samlar ni in någon Data rörande effektivitet av specifika RPA lösningar efter implementeringen?
   (a) Om ja, vilken data samlar ni in?
   (b) Varför samlas datan in?
3. Vilka faktorer har varit viktigast för en lyckad RPA-implementation historiskt sätt?

4. Kan du se några svårigheter eller nackdelar med att implementera RPA-lösningar för processer?

5. Rent ekonomiskt sätt, uppskattar du RPA implementationer till en vinst eller förlustaffär i dagsläget.

Övrigt

1. Är RPA något som är här för att stanna? Om inte vad är framtiden?

2. Är det något som du skulle vilja tillägga som vi inte pratat om?

11.2 Client contact and Questionnaire (Eng)

The interviews will be based on the principle of anonymity. However, the interviews will be recorded if that is okay. The audio files will be transcribed, translated, and then the audio files will be removed when the study is completed. If you do not want to answer anything or interrupt the interview that’s fine.

Introduction of informant and study

1. Which company/organization do you work for?

2. What is your role in the company/organization?

3. How long have you been working with it?

4. What are your main tasks?

   (a) If RPA is one of them, how long have you been working with RPA, and to what extent?

Regarding RPA

1. Tell me how far you have come in your work with automation/RPA.

2. What were your goals with introducing RPA?

3. How would you define/describe RPA?

4. How many processes have you automated?

5. In which areas/departments have these automation’s been carried out?

Analysis and evaluation

1. Are you actively working on new RPA implementations right now?

   (a) If yes, how would you say that you identify processes that are suitable for automation

   (b) Tell me how you prioritize which RPA solutions should be implemented?

   (c) Do you use any model or framework, such as ROI, CBA, or Multi-criteria analysis to analyze your RPA processes before or after implementation?
i. If yes, which factors (preferably specifically) are considered in such an analysis.
ii. Please describe this process.

2. Do you collect any data regarding the efficiency of specific RPA solutions after implementation?
   (a) If yes, what data do you collect?
   (b) Why is the data collected?

3. What factors have been most important for a successful RPA implementation historically?

4. Can you see any difficulties or disadvantages with implementing RPA solutions for processes?

5. Economically speaking, do you estimate RPA implementations to be a profit or loss deal at the moment?

Miscellaneous

1. Is RPA here to stay? If not, what is the future?

2. Is there anything you would like to add that we have not talked about?