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**Research document**

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# Introduction

During this graduation internship, there was an opportunity to work on an important assignment for Sligro, for which thorough research had to be conducted to ensure the best possible outcome. This document will provide all of the research subjects, and outcomes.

Firstly, the document will outline the specific details of the assignment and its objectives. It will also detail the current level of knowledge that is already possessed on each of the subjects relevant to the assignment at the outset of the research.

Then there will be described what research methods were used, which include a combination of the Field, Library, and Workshop strategies. The Field strategy involved conducting interviews with key stakeholders and experts within the company to gather first-hand information on their processes and systems. The Library strategy involved reviewing relevant literature and documentation, while the Workshop strategy allowed for hands-on experimentation and prototyping.

Then the results of the conducted research will be presented, detailing the advantages and disadvantages of the company's current automation techniques, as well as outlining the most efficient and sustainable ways to use automation within the company. This information will inform the conclusions drawn in the document, which will be based on a comprehensive analysis of the data collected through the research.

Throughout the research process, various sources have been consulted to ensure that the findings were accurate and comprehensive. These sources included academic articles, industry reports, company documentation, and expert interviews.

Overall, this document serves as a comprehensive account of the research conducted during the internship with Sligro. The findings and conclusions presented in this document are intended to provide a meaningful contribution to the relevant field of study, and it is hoped that they will be of value to those seeking a deeper understanding of the topic.

# Main question & Sub-questions

To provide structure to the research, One main question has been formulated with corresponding sub-questions. The main question can eventually be answered by investigating and answering these sub-questions. The main and sub-questions are presented below.

## Main question

For this research paper, the main question is:

* How does the implementation of a new robotic process automation technique ensure that automation is available as efficiently as possible?

## Sub-questions

There are several sub-questions to answer the main question:

* Which techniques are used by the company regarding automation?
* What are the advantages and disadvantages of these used techniques?
* To what extent can automation be optimized within the company?
* What is the most efficient and sustainable way to use automation within the company?

# Research methods

In this chapter, all of the used methods will be specified for each research question. The methods are sourced from the DOT research framework (Figure 1). The DOT research framework helps with giving structure to applied research regarding ICT projects[[1]](#footnote-1). In addition, it helps to determine the most effective methods beforehand and avoid unnecessary research in the future.

Which techniques are used by the company regarding automation?

The question of which techniques a company uses for automation is an important one that requires a detailed analysis of their current practices. To answer this question, two main strategies will be used: **Field** and **Library**.

The most effective approach would be to use the interview method to gain a better understanding of the specific techniques being used by the company. By arranging an interview with the Product Owner (PO), it would be possible to gain insight into the company's current practices and map out the various techniques being used. This information would then be used to inform further research and analysis.

In addition to the interview method, the document analysis method will be used to gather more information on the company's existing practices. The PO has indicated that the company possesses its own documentation on automation, and is willing to share this. By examining this documentation, it would be possible to gain a more comprehensive understanding of the techniques being used by the company.

Last but not least, a task analysis could come in handy to better understand the flow of automation that needs to be improved. This will help collect information about the tasks that the RPA solution will need to perform.

By using the interview, document & task analysis methods, it would be possible to gain a thorough understanding of the techniques currently being used by the company for automation.

What are the advantages and disadvantages of these used techniques?

Analyzing the advantages and disadvantages of the company's automation techniques is a crucial step in understanding the current state of automation and identifying potential areas for improvement. To answer this question, several strategies will be used, including **Field** and **Library** methods.

This sub-question can partially be answered by the interview of the previous sub-question. That interview can provide valuable insights into any problems or issues that the PO may have encountered with the current automation techniques.

Additionally, the best good and bad practices method can be used to evaluate the effectiveness of the company's current automation techniques. This method involves analyzing the company's existing practices and comparing them to industry best practices. By doing so, it is possible to identify areas where the company is excelling or struggling with its automation techniques.

Furthermore, the problem analysis method can be used to investigate why the company believes that its automation techniques are not currently optimal. By examining the underlying issues and challenges, it may be possible to identify specific solutions and strategies for improvement.

By combining these methods with the information gathered from the previous sub-question, it is possible to provide a comprehensive analysis of the advantages and disadvantages of the company's current automation techniques. This analysis can inform potential strategies for improvement and help the company to optimize its automation techniques to better meet its needs.

To what extent can automation be optimized within the company?

The question of how much automation can be optimized within the company is a complex one that requires a thorough analysis of the current state of automation and potential strategies for improvement. This question can be approached with the answers to the previous sub-question, because of the disadvantages of the current way of automation. These disadvantages can be examined, and help with identifying areas where optimization is needed. Next to that, the **Field** and **Library** methods will be used.

In this case, one approach would be to conduct another interview with the PO to gain a better understanding of the company's specific requirements for improving automation. This would allow for a more targeted approach to optimization that addresses the specific needs of the company.

Additionally, document analysis could be used to gather more information on how automation is currently being utilized and where there may be room for improvement. By examining existing processes and systems, it may be possible to identify areas where automation could be optimized to improve efficiency and productivity.

What is the most efficient and sustainable way to use automation within the company?

This sub-question will determine the most efficient and sustainable way to use automation within a company, and combine the knowledge from all previous questions. Next to that, two main strategies will be used: **Library** and **Workshop**.

One way to approach this question is to use the business case exploration method, which involves analyzing the costs and revenues associated with various automation options to identify the most viable solutions for the company. This approach can help to identify the most cost-effective and efficient method(s) of implementing automation.

Another effective method is prototyping, which involves creating a minimum viable product (MVP) to demonstrate the best way of automation applicable to the company's operations. This approach allows for hands-on experimentation and testing to identify the most effective automation solutions.

In addition, it may be beneficial to hold an expert interview with the company's RPA specialist to gain valuable insights and support for this sub-question. This can help to ensure that the proposed solutions are aligned with the company's current automation capabilities.

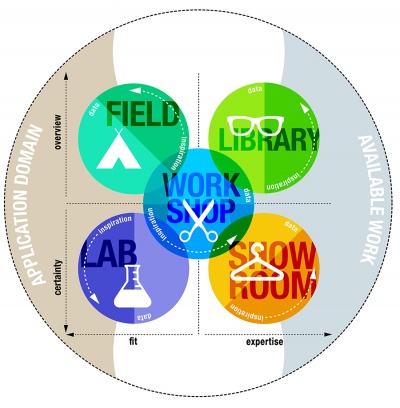


Figure 1 DOT framework

# Results

In this chapter, the results obtained for each sub-question will be documented. The sources used for the research will be listed at the end of this document.

Which techniques are used by the company regarding automation?

At the beginning of the graduation internship, an interview with the PO at Sligro made it clear which techniques are currently being used to apply automation. During the interview, the PO shared insights into the techniques used at Sligro to automate their processes. This information provides a foundation for understanding how automation is implemented in the organization. To explain the used techniques, it is important to understand the basics of the system.

Sligro currently operates on a system called AS400. AS400[[2]](#footnote-2) is a computer system developed in the late 1980s for companies to run applications and perform data processing. Despite its age, this system is still widely used by companies because it is considered secure, robust, and reliable. Figure 1 shows the graphical user interface of this system. For the scope of the project, it has been agreed that this research specifically focuses on the financial department at Sligro.

Afbeelding met tekst

Automatisch gegenereerde beschrijving

Figure 2 GUI AS400

Sligro uses specific tools to automate tasks that would otherwise require an employee to do them every time. Some examples of these tasks include checking for financial mutations, handling errors caused by missing files needed for reports, or converting data from spooled files to PDF files that need to be stored on the appropriate department's drives. They have these tasks performed by a so-called "robot". This robot is simply a type of software recorder that executes the steps one by one on the AS400 itself. While the definition is called a robot, it is important to note that there is no AI/machine learning behind it.

As previously mentioned, the company uses so-called spool files. This comes from the technique of "spooling"[[3]](#footnote-3), in which data can be temporarily stored for later processing. A spool file is a type of temporary data storage that contains data that is queued for processing on a computer system. This can be compared to the operation of a cassette tape. Due to the sensitivity of the data, no example of a Sligro spool file will be given, but figure 3 shows what a spool file might typically look like. In principle, anything can be stored in a spool file, but the spool files used during this internship mainly consist of financial data.

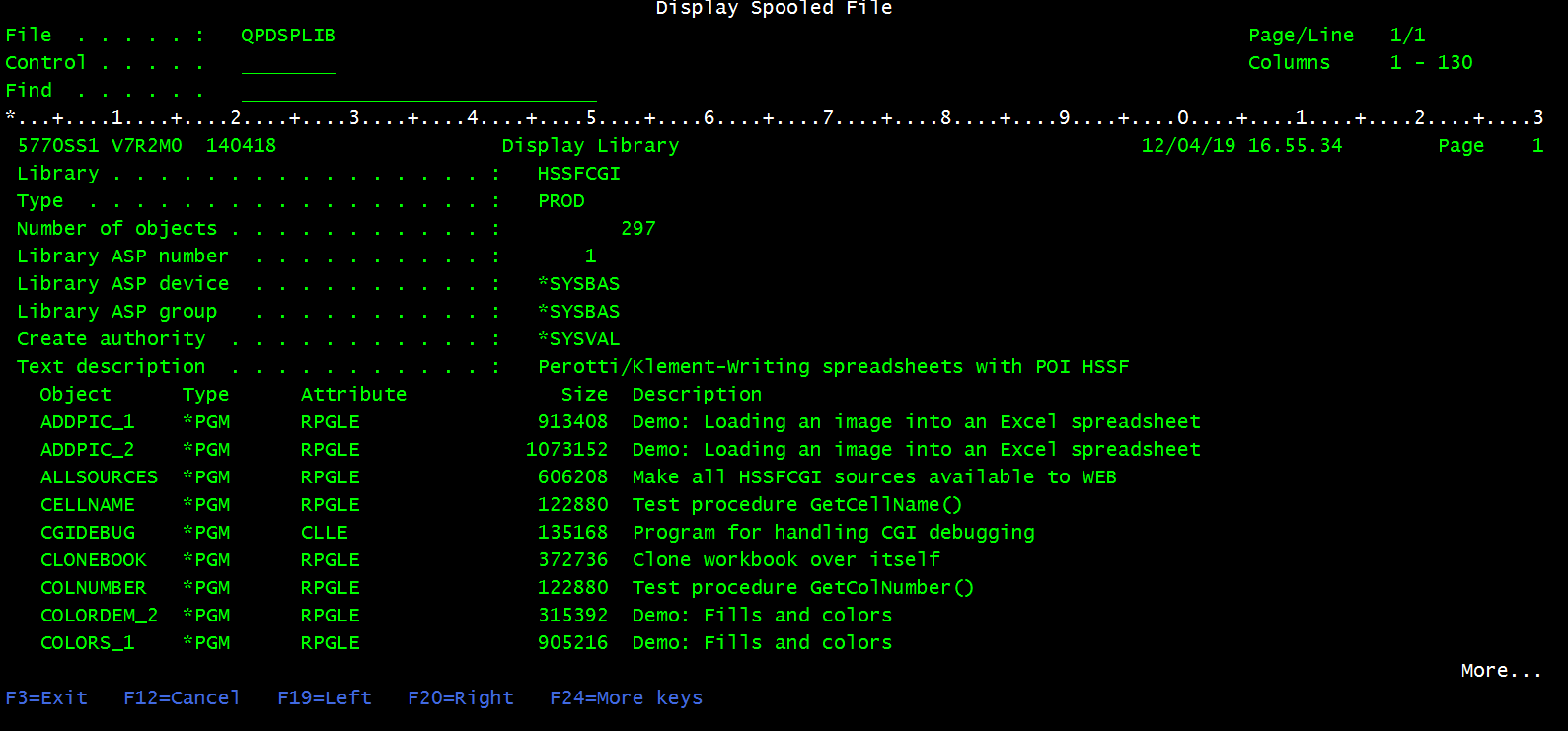


Figure 3 Example spooled file

To dive deeper into the automation tool, the current documentation provided by the company was examined. From this, it was revealed that the tool is provided by a software vendor called Kofax. Kofax[[4]](#footnote-4) is a company that specializes in Robotic Process Automation (RPA) and offers a tool for recording software. Officially called information-capture software, it serves as a type of screen recorder in the case of Sligro, enabling actions to be automated. Kofax has a design studio, as seen in figure 4, which makes it very easy to automate processes based on a graphical user interface.

Foto invoegen van de design studio

To gain a better understanding of all the tasks performed by the robot, a task analysis was conducted to examine all the steps the bot executes on the AS400. The steps could be derived from the design studio. The robot runs every Monday to Saturday between 07:00 and 08:00 and runs for fifteen minutes. Originally, it ran for 10 minutes, but because the tasks became larger, it had to be extended to 15 minutes, otherwise, the bot would stop before all the tasks were completed.

The tasks performed by the bot are as follows:

* Logging in on the AS400.
* Checking for any unprocessed financial mutations. The robot accomplishes this by verifying whether certain records are empty or non-existent. This can be seen in figure X. If no records are present, the robot can proceed to the next task.Afbeelding met tekst

  Automatisch gegenereerde beschrijving

Figure 4 Empty Records

* If there are any unprocessed financial transactions, the robot will send an error message via email to the responsible parties (see figure x). The robot will then continue to check every 15 minutes between 7:00 and 8:00 a.m. to see if the records have been processed. If the outstanding records are not processed by 8:00 a.m., the robot will need to be manually restarted or the tasks will have to be done manually.

Figure 5 Error handling

* Once all financial mutations are processed, the robot moves on to printing necessary documents. It's important to note that these documents are not actually printed by a physical printer, but are converted from spool files to physical files on the server. Some examples of printed documents include outstanding purchase orders and purchase invoices. Once this data is converted, the robot can move on to the next step.
* In this step, the robot retrieves data from the previous step and places it in an Excel document. By setting up rules, the robot knows exactly which line in which file to search for the correct data. Figure x shows that the numbers in the Excel document are obtained from various overviews, with the highlighted blue lines being the list overviews from which the robot precisely retrieves the data, and the light orange ones being the calling procedures. 

Figure 6 Moving data from physical file to Excel

* In the final step, the robot digitizes several lists from a spool file to a PDF file and then is sent to the hard disk of the appropriate department. Specifically, this concerns the lists "Outstanding purchase invoices" and "Overview of outstanding purchase orders". Figure x shows the result of this action. Afbeelding met tafel

  Automatisch gegenereerde beschrijving

Figure 7 Digitized files sent to the right department

In order to provide a clear overview of all the tasks mentioned above, an activity diagram has been created using the principles of Lucidchart[[5]](#footnote-5). This diagram, which can be found on figure X, visually represents the flow of the robot's activities from start to finish. By using this diagram, it becomes easier to understand the different steps involved in the process and how they are connected to each other. The diagram serves as a helpful tool for those involved in the development and maintenance of the robot, allowing for a better understanding of the entire process and facilitating any necessary adjustments or improvements.

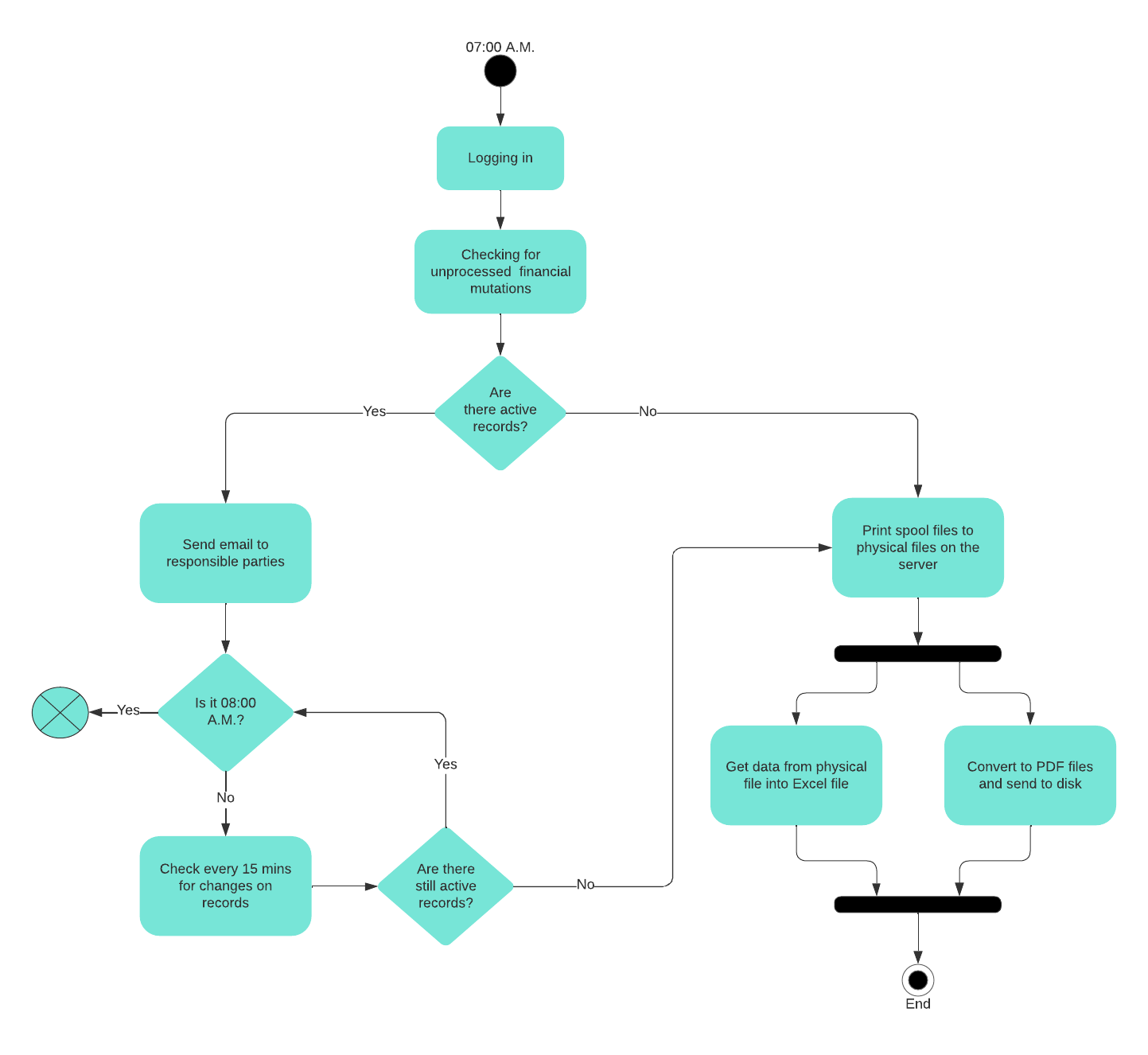


Figure 8 Activity diagram of the robot

What are the advantages and disadvantages of these used techniques? (sprint 2)

To what extent can automation be optimized within the company? (sprint 3)

What is the most efficient and sustainable way to use automation within the company? (sprint 4)

# Conclusions

This chapter aims to provide a comprehensive overview of the conclusions that have been drawn from each sub-question. A brief conclusion for each sub-question will be presented, and then the main question will be answered by drawing upon the conclusions that have been reached. This will ensure that the conclusion is based on a thorough analysis of all the sub-questions and their conclusions. By doing so, the main question can be answered in a precise and comprehensive manner, while taking into account all the relevant factors that have been identified throughout the research process.

Which techniques are used by the company regarding automation?

What are the advantages and disadvantages of these used techniques?

To what extent can automation be optimized within the company?

What is the most efficient and sustainable way to use automation within the company?

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This chapter contains all the sources that were used in this research. These sources were documented using the APA method.

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