

# Role of RPA and AI Based Document Processing in Project Management

MSc Artificial Intelligence for Business

Dilara Tosun  
Student ID:22191381

School of Computing  
National College of Ireland

Supervisor: Victor Del Rosal

National College of Ireland  
Project Submission Sheet  
School of Computing



|                             |                                                                    |
|-----------------------------|--------------------------------------------------------------------|
| <b>Student Name:</b>        | Dilara Tosun                                                       |
| <b>Student ID:</b>          | 22191381                                                           |
| <b>Programme:</b>           | AI for Business                                                    |
| <b>Year:</b>                | 2023                                                               |
| <b>Module:</b>              | MSc Research Project                                               |
| <b>Supervisor:</b>          | Victor Del Rosal                                                   |
| <b>Submission Due Date:</b> | 30th January 2024                                                  |
| <b>Project Title:</b>       | Role of RPA and AI Based Document Processing in Project Management |
| <b>Word Count:</b>          | XXX                                                                |
| <b>Page Count:</b>          | 16                                                                 |

I hereby certify that the information contained in this (my submission) is information pertaining to research I conducted for this project. All information other than my own contribution will be fully referenced and listed in the relevant bibliography section at the rear of the project.

**ALL** internet material must be referenced in the bibliography section. Students are required to use the Referencing Standard specified in the report template. To use other author's written or electronic work is illegal (plagiarism) and may result in disciplinary action.

|                   |                   |
|-------------------|-------------------|
| <b>Signature:</b> |                   |
| <b>Date:</b>      | 30th January 2024 |

**PLEASE READ THE FOLLOWING INSTRUCTIONS AND CHECKLIST:**

|                                                                                                                                                                                            |                          |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------|
| Attach a completed copy of this sheet to each project (including multiple copies).                                                                                                         | <input type="checkbox"/> |
| <b>Attach a Moodle submission receipt of the online project submission</b> , to each project (including multiple copies).                                                                  | <input type="checkbox"/> |
| <b>You must ensure that you retain a HARD COPY of the project</b> , both for your own reference and in case a project is lost or mislaid. It is not sufficient to keep a copy on computer. | <input type="checkbox"/> |

Assignments that are submitted to the Programme Coordinator office must be placed into the assignment box located outside the office.

| <b>Office Use Only</b>           |  |
|----------------------------------|--|
| Signature:                       |  |
| Date:                            |  |
| Penalty Applied (if applicable): |  |

# Role of RPA and AI Based Document Processing in Project Management

Dilara Tosun  
22191381

## **Abstract**

This thesis investigates the transformative impact of Robotic Process Automation (RPA) and Artificial Intelligence (AI) technologies in the field of project management in an accounting unit. Our main goal and focus is to reorganize the division of labor and automate invoice reading processes. By applying RPA and AI tools, it has been analyzed how these technologies streamline workflow, increase accuracy and optimize time management in processing dense financial documents. The research adopted an experimental study approach examining a specific accounting unit to demonstrate the practical results of RPA and AI integration. The findings highlight the potential of these technologies to transform traditional accounting practices. This study not only provides insights into the operational benefits of RPA and AI, but also discusses the challenges and considerations for successful implementation. Aiming for a sustainable and long-term study, it offers a perspective that reduces the waste of human labor in unnecessary areas and aims to perform repetitive operations by AI. This article uses a series of empirical case studies and quantitative analysis methodologies to evaluate the effectiveness of RPA and AI-based document processing systems and their impact on workflows. These methods are designed to measure and improve the efficiency, error rates, and user experience of systems.

Keywords: Robotic Process Automation (RPA), Artificial Intelligence (AI), Project Management, Accounting Automation, Invoice Processing, Workflow Optimization, Efficiency Improvement, Technology Integration, Operational Efficiency, Digital Transformation

# 1 Introduction

Today, automating business processes offers great potential for efficiency and accuracy. At the same time, it is not a very reasonable idea in today's age to exhaust an important resource, such as human intelligence, with repetitive and thoughtless tasks. The purpose of this study is to examine the impact of Robotic Process Automation and Artificial Intelligence-based document processing on project management processes. The focus of the research is the automation of tasks such as invoice processing in accounting units and the impact of these technologies on the division of labor.

Existing literature on how RPA and AI technologies transform business processes and increase efficiency, highlights the potential of these technologies. In the study titled Artificial Intelligence and its effects on the accounting profession for future accountants: A systematic literature review [Nwosu et al.], it is discussed how Artificial Intelligence is changing the accounting profession and the benefits of improving and redesigning activities.

In the article titled A Review of the Robotic Process Automation's Impact as a Disruptive Innovation in Accounting and Audit, it shows the impact of RPA technology as a holistic approach that makes accounting and auditing processes more dynamic, secure and reliable[Mookerjee et al., 2021].

Our study reveals the practical applications and benefits of these technologies through the examination of a specific accounting unit.

## 1.1 Methodology and Review Process

To conduct our study, we created a methodology and researched and analyzed the day-to-day operations of a real office, focusing specifically on the intricacies of the accounting department. This interactive approach allowed us to see directly how these advanced technologies are integrated into the workflow, offering a unique perspective on their practical applications.

## 1.2 Answering Key Research Questions

Our research aims to answer fundamental questions about the impact of robotics and artificial intelligence technologies on accounting processes. We examined the way these technologies contribute to the efficiency and accuracy of accounting tasks and explored their overall impact on project management dynamics. In addition, we tried to answer questions such as comparison with manpower and the positive and negative effects of the process.

## 1.3 Aims and Results

We aimed to evaluate the concrete results obtained from robotics and artificial intelligence technologies in accounting applications. Thus, we aimed to make concrete suggestions to optimize workflows in accounting units. For this purpose, we tried to simulate the daily workflow in this unit by reaching 10 participants.

## **1.4 Expected Benefits and Contributions**

According to our expectations, the use of robotics and artificial intelligence technologies in accounting processes would lead to significant improvements in efficiency and minimize the likelihood of errors. Beyond these expected positive outcomes, our research aims to make a meaningful contribution to the practical challenges and success factors associated with the adoption of these transformative technologies.

## **1.5 Report Structure and Detailed Analysis**

The structure of our report was created to provide a comprehensive understanding of our findings. Following the introduction, we presented a detailed review of the existing literature and focused on key insights from previous studies. The methods section provided transparency into our review process, while the findings section offered a detailed analysis of our observations. The discussion segment aimed to better understand the practical implications of the integration of robotics and AI in accounting offices by delving into the implications of our findings.

## **1.6 Conclusion and Future Implications**

Our report concludes by summarizing key takeaways and considering potential future impacts. In this way, we aimed to offer not only a retrospective view of our findings, but also a forward perspective on the ongoing evolution of robotics and artificial intelligence in accounting.

## 2 Related Work

In recent years, Robotic Process Automation and Artificial Intelligence have made a significant impact in the accounting and finance industries. As stated in the article "Robotic Process Automation to Aid Accounting and Finance Departments" [Kokina and Blanchette, 2019] written by Kokina, Julia and Blanchette, Shay, RPA; It automates accounting processes and reduces workload by performing tedious, repetitive and low-value tasks. In this way, it encourages the use of manpower in higher value jobs. Additionally, as highlighted in Amy Foshee Holmes and Ashley Douglass' article "Artificial Intelligence: Reshaping the Accounting Profession and the Disruption to Accounting Education," AI has the capacity to automate repetitive, high-volume, and time-consuming tasks, reshaping the accounting profession [Holmes and Douglass, 2022].

The article "Robotic Process Automation Implementation Case Studies in Accounting: A Beginning to End Perspective" by Chanyuan Abigail Zhang et al [Zhang et al., 2023] has attempted to provide practical examples of how RPA can be implemented in accounting processes, examining the strategies and impacts of implementing this technology . The article "Impact of RPA technologies on accounting systems" points out that although AI and RPA are interconnected, they are different and separate technologies and how AI can be used in human decision-making capacity in organizations [Kaya et al., 2019].

The article "The Future of Accounting: How RPA and AI Will Revolutionize the Industry" focuses on how RPA and AI may impact the accounting industry and how it will change the roles of accountants. These technologies have the potential to catch up and maximize efficiency in the industry by allowing accountants to perform more strategic roles than manual data entry and report generation. The article "Robotic accounting: an RPA guide for accounts teams" also details how RPA can be implemented for account teams and integrated with various software [Jedrzejka et al., 2019].

In a general literature review of articles titled "Forecasting with Artificial Intelligence in Accounting", we frequently come across applications of AI in financial accounting, especially for forecasting purposes. The study, titled Forecasting in financial accounting with artificial intelligence – A systematic literature review and future research agenda, acknowledges that accounting information systems are mostly rule-based and often lag behind in adopting current technological developments such as AI. While he emphasizes that the use of AI in financial accounting is generally limited to pilot projects, he draws attention to the potential and possible contributions of AI-based forecasts for detailed analysis. [Kureljusic and Karger, 2023]

This article titled Transformation of Robotic Process Automation in Accounting and Auditing [Gotthardt et al., 2020] discusses how robotic process automation creates a transformation in the fields of accounting and auditing. He states that new technologies have the ability to perform repetitive tasks faster and more accurately than humans by mimicking human activities. It provides an overview of how RPA can transform the profession, especially in the field of revenue audits. For example, important tax activities such as calculating book-tax differences and preparing tax returns have been successfully automated by RPA software robots. In the article, the positive effects of using RPA are mentioned and the benefits of its use in many other areas are mentioned.

These articles generally focus on how RPA and AI are automating processes, increasing efficiency, reducing workload, and changing the roles of accountants in accounting and finance. AI and RPA technologies make all these processes more efficient and effective.

## 3 Methodology

### 3.1 Research and Evaluation Methodology

This study aims to explore the impact of Robotic Process Automation and Artificial Intelligence based document processing on project management processes. Current literature is limited in detailing the effects and potentials of these technologies, especially in the accounting field. This gap underscores the significance and scientific rigor of this research. The study investigates how RPA and AI influence workflows, efficiency, and accuracy, while also considering how these technologies could transform traditional accounting practices.

### 3.2 Research Process

#### 3.2.1 First Stage - Creating e-Invoices and XML Files

The research began with the creation of e-invoices using dummy data. This process was designed to simulate common data management scenarios encountered in accounting practices. In Figure 1, an example e-invoice is provided.

Figure 1: E-Invoice sample

**Sample Supplier 1**  
Dublin 1 Dublin / Ireland  
e-Posta: info@sample1.com

**DEAR**  
DILARA TOSUN  
Mayor Street Lower, International Financial Services Centre, Dublin  
1 / Ireland

**e-invoice**

**LOGO**

|                          |                  |
|--------------------------|------------------|
| <b>Date:</b>             | 16-11-2023       |
| <b>Invoice No:</b>       | XXX2021000078804 |
| <b>Customization No:</b> | IE1.2            |
| <b>Script:</b>           | BASIC INVOICE    |
| <b>Invoice Type:</b>     | SALES            |
| <b>Payment Due Date:</b> | 26-11-2023       |
| <b>Creation Time:</b>    | 19:58:54         |

| Services                         | Quantity  | Unit Price | Service Price | VAT Rate | VAT Amount |
|----------------------------------|-----------|------------|---------------|----------|------------|
| CARGO TRANSPORTATION SERVICE FEE | 1,0 Piece | 119,05€    | 119,05€       | %18,00   | 21,43€     |
| ASSEMBLY FEE                     | 1,0 Piece | 50,00€     | 50,00€        | %18,00   | 9,00€      |

|                        |         |
|------------------------|---------|
| Service Total Amount:  | 169,05€ |
| VAT Base (%18):        | 169,05€ |
| Tax Excluded Amount:   | 169,05€ |
| Calculated VAT (%18) : | 30,43€  |
| Total Amount:          | 199,48€ |
| Amount Payable:        | 199,48€ |

Using UiPath, XML reading of these invoices was conducted, and a project was developed to transfer invoice information to Excel. The 'Execute XML' method was employed during XML reading, and UiPath's queue structure ensured efficient sequential processing of the invoices. This stage was critical to demonstrating how RPA integration can optimize data management and process workflows. Figure 2 shows an example of xml file.

Figure 2: XML file sample

This XML file does not appear to have any style information associated with it. The document tree is shown below.

```
<?xml version="1.0" encoding="UTF-8" ?>
<Invoice>
  <Detail>
    <CustomizationID>IE1.2</CustomizationID>
    <ProfileID>BASIC INVOICE</ProfileID>
    <ID>XXX2021000078804</ID>
    <IssueDate>2023-11-16</IssueDate>
    <DueDate>2023-11-26</DueDate>
    <IssueTime>19:58:54</IssueTime>
    <InvoiceTypeCode>SALES</InvoiceTypeCode>
  </Detail>
  <Supplier>
    <Name>Sample Supplier 1</Name>
    <Address>Dublin 1 Dublin / Ireland</Address>
    <eposta>info@sample1.com</eposta>
  </Supplier>
  <Customer>
    <Name>DILARA TOSUN</Name>
    <Address>Mayor Street Lower, International Financial Services Centre, Dublin 1 / Ireland</Address>
  </Customer>
  <ServiceList>
    <Item>
      <Name>CARGO TRANSPORTATION SERVICE FEE</Name>
      <Quantity>1,0 Piece</Quantity>
      <UnitPrice>119,05€</UnitPrice>
      <ServicePrice>119,05€</ServicePrice>
      <VATRate>%18,00</VATRate>
      <VATAmount>21,43€</VATAmount>
    </Item>
    <Item>
      <Name>ASSEMBLY FEE</Name>
      <Quantity>1,0 Piece</Quantity>
      <UnitPrice>50,00€</UnitPrice>
      <ServicePrice>50,00€</ServicePrice>
      <VATRate>%18,00</VATRate>
      <VATAmount>9,00€</VATAmount>
    </Item>
  </ServiceList>
  <LegalMonetaryTotal>
    <ServiceTotalAmount>169,05€</ServiceTotalAmount>
    <VATBase>169,05€</VATBase>
    <TaxExcludedAmount>169,05€</TaxExcludedAmount>
    <CalculatedVAT>30,43€</CalculatedVAT>
    <TotalAmount>199,48€</TotalAmount>
    <PayableAmount>199,48€</PayableAmount>
  </LegalMonetaryTotal>
</Invoice>
```

### 3.2.2 Second Stage - Creating Database

In the second stage, a database necessary for task division and tracking was established and populated with test data. Figure 3 shows connected databases.

This step allowed for the assessment of process efficiency and effectiveness. The setup and management of the database provided valuable insights into how data flow and resource management in business processes could be enhanced. In Figure 4 shows an example databases.



Figure 3: Connected databases

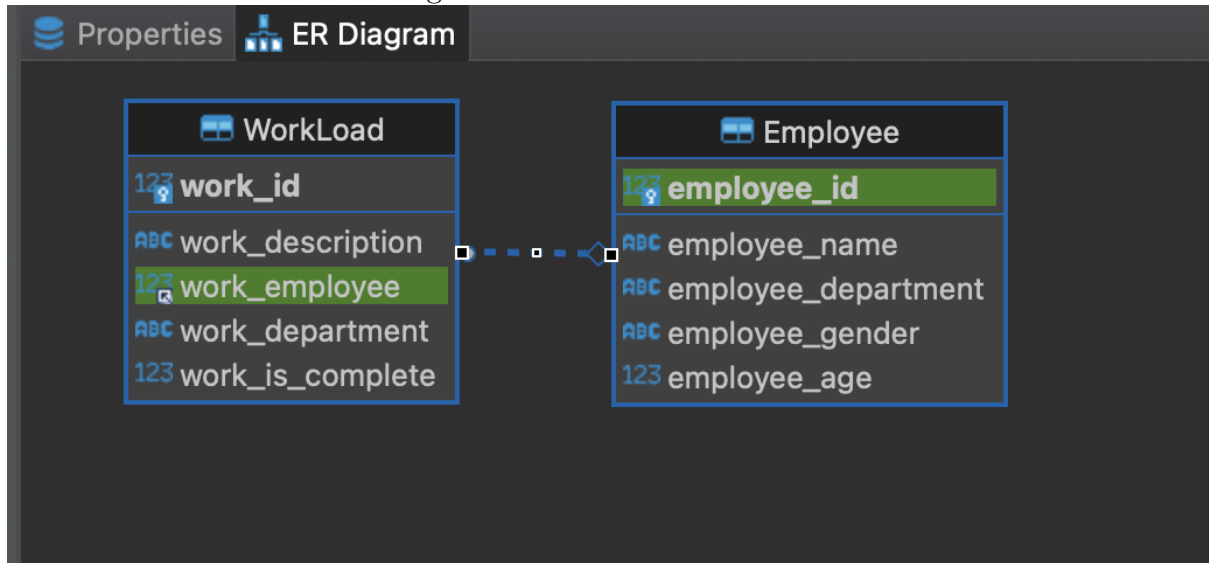


Figure 4: Sample database

| employee_id | employee_name | employee_department | employee_gender | employee_age | work_id | work_description | employee_department        | work_is_complete |
|-------------|---------------|---------------------|-----------------|--------------|---------|------------------|----------------------------|------------------|
| 1           | Employee1     | Accounting          | Female          | 30           | 6       | Sample6.xml      | 1 Marketing                | 1                |
| 2           | Employee2     | Accounting          | Female          | 31           | 26      | Sample26.xml     | 2 Accounting               | 1                |
| 3           | Employee3     | Accounting          | Female          | 22           | 3       | Sample3.xml      | 3 Legal                    | 1                |
| 4           | Employee4     | Accounting          | Male            | 24           | 2       | Sample2.xml      | 4 Research and Development | 1                |
| 5           | Employee5     | Accounting          | Female          | 29           | 1       | Sample1.xml      | 5 Business Development     | 1                |
| 6           | Employee6     | Accounting          | Female          | 23           | 4       | Sample4.xml      | 6 Product Management       | 1                |
| 7           | Employee7     | Accounting          | Male            | 23           | 12      | Sample12.xml     | 7 Human Resources          | 1                |
| 8           | Employee8     | Accounting          | Female          | 36           | 864     | Sample864.xml    | 8 Research and Development | 1                |
| 9           | Employee9     | Accounting          | Female          | 30           | 8       | Sample8.xml      | 9 Training                 | 1                |
| 10          | Employee10    | Accounting          | Female          | 33           | 13      | Sample13.xml     | 10 Sales                   | 1                |

### 3.2.3 Third Stage

The third stage involved integrating AI into task division roles using RapidMiner, followed by conducting test studies. This integration aimed to evaluate the impact of AI on workflows and task optimization. The inclusion of AI facilitated the analysis of complex data sets and enabled smarter and more effective management of business processes.

### 3.2.4 Fourth Stage

Experimental studies were conducted with 10 participants, who were given 15 trials of tasks performed by AI. The results of these trials were recorded, and average values were presented in Table 1 for director Mona's tasks such as dividing the work, forwarding the necessary invoices to Business users and checking the returned reports. The task of Business Users such as reading the sent invoices, preparing an output report and sending the result back to the director is shown in the Table 2. Comparing the speed of humans and robots/AI in this stage showed how technology lagged in business processes. This finding further reinforced the importance and investigability of the research topic,

highlighting the efficiency and limitations of AI and RPA in business processes.

Table 1: Director's Duties

| Number | P1    | P2    | P3    | P4    | P5    | P6    | P7    | P8    | P9    | P10   |
|--------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| 1      | 14:47 | 16:45 | 13:36 | 14:54 | 12:57 | 16:13 | 12:46 | 18:32 | 13:19 | 13:56 |
| 2      | 14:36 | 16:14 | 13:01 | 14:32 | 12:43 | 16:45 | 13:11 | 18:51 | 13:50 | 14:27 |
| 3      | 13:29 | 16:09 | 12:57 | 14:02 | 13:02 | 16:43 | 12:51 | 17:53 | 13:46 | 13:59 |
| 4      | 13:53 | 15:49 | 13:54 | 14:54 | 12:34 | 15:56 | 12:57 | 17:38 | 13:27 | 13:03 |
| 5      | 13:22 | 15:44 | 12:55 | 13:25 | 12:17 | 15:44 | 13:08 | 18:06 | 14:28 | 13:28 |
| 6      | 12:02 | 15:05 | 12:23 | 14:03 | 13:06 | 16:11 | 13:58 | 18:30 | 14:06 | 12:58 |
| 7      | 12:05 | 16:11 | 13:09 | 13:39 | 12:50 | 16:05 | 13:23 | 18:25 | 13:51 | 12:43 |
| 8      | 11:21 | 16:58 | 12:55 | 13:56 | 12:48 | 15:52 | 12:48 | 17:49 | 14:49 | 12:54 |
| 9      | 12:56 | 15:53 | 13:11 | 13:58 | 12:23 | 15:11 | 12:09 | 17:24 | 14:31 | 12:44 |
| 10     | 12:46 | 15:04 | 13:09 | 14:03 | 13:04 | 14:49 | 11:52 | 18:03 | 15:02 | 12:02 |
| 11     | 12:07 | 15:48 | 12:45 | 14:06 | 13:48 | 15:47 | 12:06 | 18:39 | 14:19 | 11:57 |
| 12     | 12:19 | 14:04 | 12:32 | 14:01 | 12:06 | 15:02 | 12:15 | 17:19 | 15:02 | 11:51 |
| 13     | 11:19 | 15:06 | 13:02 | 13:56 | 12:33 | 14:51 | 11:57 | 17:51 | 14:29 | 12:01 |
| 14     | 11:57 | 14:35 | 12:44 | 13:45 | 12:36 | 15:05 | 12:04 | 18:03 | 14:32 | 11:30 |
| 15     | 12:06 | 16:05 | 12:57 | 13:41 | 12:58 | 15:43 | 11:58 | 18:41 | 14:25 | 11:42 |
| Avg:   | 12:44 | 15:42 | 13:00 | 14:03 | 12:47 | 15:43 | 12:37 | 18:06 | 14:15 | 12:45 |

Table 2: Business User's Duties

| Number | P1    | P2    | P3    | P4    | P5    | P6    | P7    | P8    | P9    | P10   |
|--------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| 1      | 14:47 | 16:45 | 13:36 | 14:54 | 12:57 | 16:13 | 12:46 | 18:32 | 13:19 | 13:56 |
| 2      | 14:36 | 16:14 | 13:01 | 14:32 | 12:43 | 16:45 | 13:11 | 18:51 | 13:50 | 14:27 |
| 3      | 13:29 | 16:09 | 12:57 | 14:02 | 13:02 | 16:43 | 12:51 | 17:53 | 13:46 | 13:59 |
| 4      | 13:53 | 15:49 | 13:54 | 14:54 | 12:34 | 15:56 | 12:57 | 17:38 | 13:27 | 13:03 |
| 5      | 13:22 | 15:44 | 12:55 | 13:25 | 12:17 | 15:44 | 13:08 | 18:06 | 14:28 | 13:28 |
| 6      | 12:02 | 15:05 | 12:23 | 14:03 | 13:06 | 16:11 | 13:58 | 18:30 | 14:06 | 12:58 |
| 7      | 12:05 | 16:11 | 13:09 | 13:39 | 12:50 | 16:05 | 13:23 | 18:25 | 13:51 | 12:43 |
| 8      | 11:21 | 16:58 | 12:55 | 13:56 | 12:48 | 15:52 | 12:48 | 17:49 | 14:49 | 12:54 |
| 9      | 12:56 | 15:53 | 13:11 | 13:58 | 12:23 | 15:11 | 12:09 | 17:24 | 14:31 | 12:44 |
| 10     | 12:46 | 15:04 | 13:09 | 14:03 | 13:04 | 14:49 | 11:52 | 18:03 | 15:02 | 12:02 |
| 11     | 12:07 | 15:48 | 12:45 | 14:06 | 13:48 | 15:47 | 12:06 | 18:39 | 14:19 | 11:57 |
| 12     | 12:19 | 14:04 | 12:32 | 14:01 | 12:06 | 15:02 | 12:15 | 17:19 | 15:02 | 11:51 |
| 13     | 11:19 | 15:06 | 13:02 | 13:56 | 12:33 | 14:51 | 11:57 | 17:51 | 14:29 | 12:01 |
| 14     | 11:57 | 14:35 | 12:44 | 13:45 | 12:36 | 15:05 | 12:04 | 18:03 | 14:32 | 11:30 |
| 15     | 12:06 | 16:05 | 12:57 | 13:41 | 12:58 | 15:43 | 11:58 | 18:41 | 14:25 | 11:42 |
| Avg:   | 12:44 | 15:42 | 13:00 | 14:03 | 12:47 | 15:43 | 12:37 | 18:06 | 14:15 | 12:45 |

## 4 Design Specification

### 4.1 RPA and AI System Design

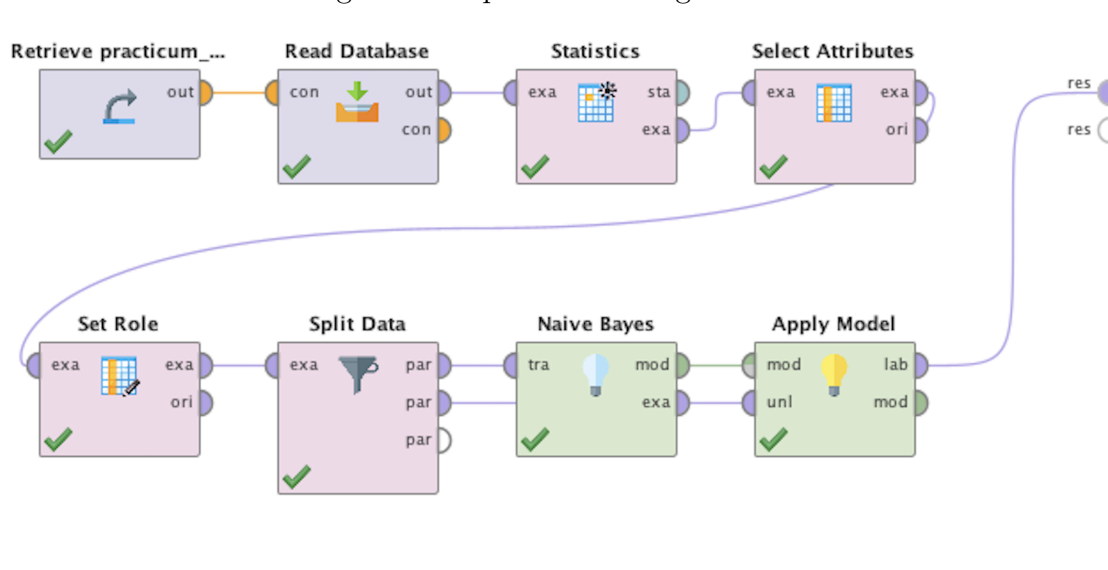
#### 4.1.1 Database Design

At the core of our project is a sophisticated database that stores extensive information about employees. This database, encompassing over 1000 rows, includes employee names, their associated departments (such as sales, human resources, etc.), experiences, and the business units they are registered with. This comprehensive database not only stores vital information but also enables the AI and RPA systems to make more personalized task assignments based on the detailed profiles of employees.

#### 4.1.2 AI Implementation with RapidMiner

RapidMiner is crucial in processing the rich dataset from the database, forming the foundation of our AI model. The data is divided into 70% for training and 30% for testing, allowing the model to be trained on a wide dataset and subsequently tested in real-world scenarios. The Naive Bayes method is employed to develop predictive models used for assigning tasks to employees, based on their past experiences and skills. Figure 5 shows the RapidMiner design.

Figure 5: RapidMiner Design

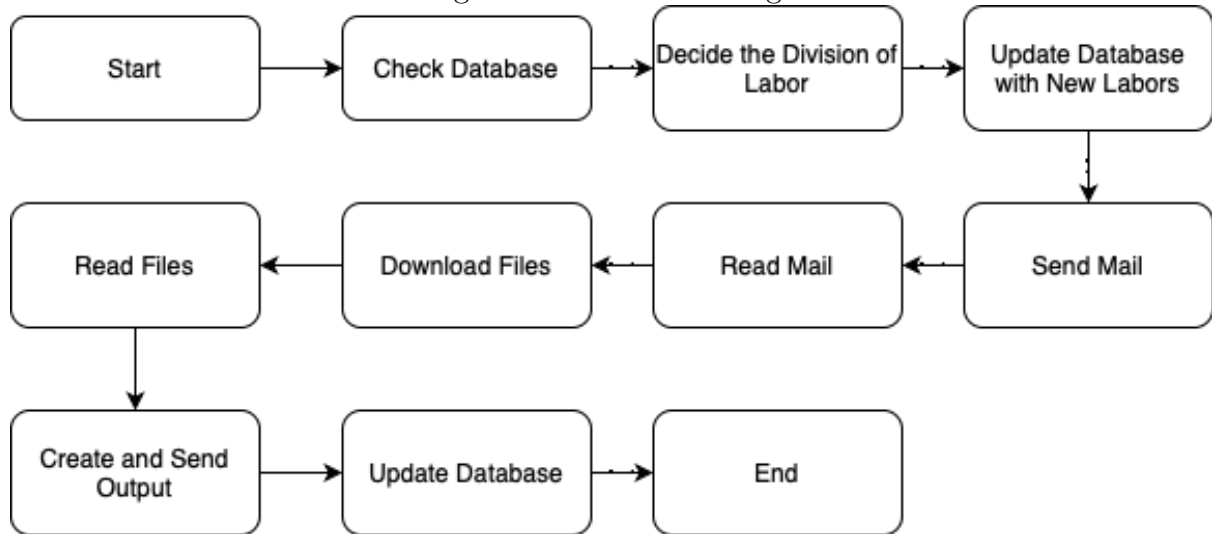


#### 4.1.3 RPA Steps with UiPath

UiPath initiates the automated invoice processing by retrieving necessary information from the database. It identifies the paths to individual invoices and notifies the respective employees via email. This process ensures active employee participation in the workflow and increases transparency. UiPath then adds the addresses of documents downloaded from emails and stored in specific folders to its queue structure and starts processing these documents. Once all the invoices in the queue are processed, UiPath compiles a report and sends it to the designated directors via email. This step is a crucial feedback

mechanism confirming the efficiency and effectiveness of the automation process. In Figure 6 shows the flowchart design.

Figure 6: Flowchart Design



## 4.2 Application Requirements

Key requirements for the successful operation of the application include:

### 4.2.1 Software Tools

UiPath and RapidMiner play central roles in the automation and artificial intelligence aspects of the project. These tools are necessary for automating the workflow and training AI models.

### 4.2.2 Dynamic Database Interaction

DBeaver is used to create a database that is up-to-date and compatible with these tools. This ensures continuous data updates and easy accessibility.

### 4.2.3 Test Data Volume

At least 1000 rows of test data are required for the system to generate accurate and reliable results from a broad dataset.

### 4.2.4 Sample Documents

At least 50 sample XML and HTML invoices are needed to test and train the AI and RPA systems, providing diversity to assess how the systems would perform in real-world scenarios. You can see the samples in Figure 1 and Figure 2.

## 5 Implementation

In this Implementation section, we will delve into the final stage of executing our proposed solution, focusing on the key outputs generated and the pivotal tools and methodologies employed to realize our research objectives. This overview aims to showcase the practical application of our theoretical framework and the tangible results it yielded.

### 5.1 Report Example

Reports align with the project’s objectives of data analysis and optimization of business processes. These outputs provide critical insights on how processes can be improved, thereby supporting strategic decisions in workflow management. The final version of output report is shown in the Table 3.

Table 3: Output Report Example

| Supp Name | Supplier Address          | Customer Name | Customer Address   | Invoice Date | Invoice No       | Payment Date | Service Details                                | Total Amount |
|-----------|---------------------------|---------------|--------------------|--------------|------------------|--------------|------------------------------------------------|--------------|
| Supp 5    | Dublin 8 Dublin / Ireland | DILARA TOSUN  | Mayor Street Lower | 2023-12-25   | XXX2411000065129 | 2024-01-05   | -SERVER RENTING SERVICE                        | 212,40€      |
| Supp 4    | Dublin 1 Dublin / Ireland | DILARA TOSUN  | Mayor Street Lower | 2023-11-18   | XXX8751000012735 | 2023-11-28   | -PRINTER-PRINTER CARTRIDGE-COPIER PAPER A4     | 155,76€      |
| Supp 1    | Dublin 1 Dublin / Ireland | DILARA TOSUN  | Mayor Street Lower | 2023-11-16   | XXX2021000078804 | 2023-11-26   | -CARGO TRANSPORTATION SERVICE FEE-ASSEMBLY FEE | 199,48€      |
| Supp 3    | Dublin 1 Dublin / Ireland | DILARA TOSUN  | Mayor Street Lower | 2023-12-2    | XXX5061000087394 | 2023-12-12   | -SOFTWARE SERVICE-SUPPORT SERVICE              | 885,00€      |
| Supp 2    | Dublin 3 Dublin / Ireland | DILARA TOSUN  | Mayor Street Lower | 2023-10-18   | XXX3081000049950 | 2023-10-28   | -CLEANING SERVICE-CLEANING PRODUCTS            | 106,20€      |

### 5.2 RapidMiner Output Example

Outputs from RapidMiner demonstrate the capabilities in AI modeling and data processing. They contribute to the project’s objectives of efficiency and effectiveness by enhancing data-driven decision-making processes. You can see the result example in Figure 7.

Figure 7: RapidMiner Result Example

| Row No. | Employee_...  | prediction(...) | confidence(...) | confidence(...) | confidence(...) | confidence(...) | confidence(...) | confidence(...) |
|---------|---------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|
| 1       | Employee1 ... | Employee3 ...   | 0.016           | 0.016           | 0.822           | 0.000           | 0.048           | 0.000           |
| 2       | Employee1 ... | Employee1 ...   | 0.725           | 0.025           | 0.000           | 0.088           | 0.050           | 0.000           |
| 3       | Employee1 ... | Employee10...   | 0.015           | 0.000           | 0.030           | 0.015           | 0.015           | 0.061           |
| 4       | Employee1 ... | Employee1 ...   | 0.725           | 0.025           | 0.000           | 0.088           | 0.050           | 0.000           |
| 5       | Employee1 ... | Employee1 ...   | 0.725           | 0.025           | 0.000           | 0.088           | 0.050           | 0.000           |
| 6       | Employee1 ... | Employee1 ...   | 0.725           | 0.025           | 0.000           | 0.088           | 0.050           | 0.000           |
| 7       | Employee1 ... | Employee2 ...   | 0.725           | 0.025           | 0.000           | 0.088           | 0.050           | 0.000           |
| 8       | Employee1 ... | Employee2 ...   | 0.025           | 0.797           | 0.051           | 0.025           | 0.013           | 0.076           |
| 9       | Employee1 ... | Employee1 ...   | 0.725           | 0.025           | 0.000           | 0.088           | 0.050           | 0.000           |
| 10      | Employee1 ... | Employee1 ...   | 0.725           | 0.025           | 0.000           | 0.088           | 0.050           | 0.000           |
| 11      | Employee1 ... | Employee1 ...   | 0.725           | 0.025           | 0.000           | 0.088           | 0.050           | 0.000           |
| 12      | Employee1 ... | Employee1 ...   | 0.725           | 0.025           | 0.000           | 0.088           | 0.050           | 0.000           |
| 13      | Employee1 ... | Employee1 ...   | 0.725           | 0.025           | 0.000           | 0.088           | 0.050           | 0.000           |
| 14      | Employee1 ... | Employee1 ...   | 0.725           | 0.025           | 0.000           | 0.088           | 0.050           | 0.000           |
| 15      | Employee1 ... | Employee1 ...   | 0.725           | 0.025           | 0.000           | 0.088           | 0.050           | 0.000           |
| 16      | Employee1 ... | Employee1 ...   | 0.725           | 0.025           | 0.000           | 0.088           | 0.050           | 0.000           |

## **5.3 Tools and Languages Used**

UiPath - As an RPA Tool UiPath is a leading tool in the RPA landscape and a cornerstone for our project. Its queue structure and REFramework allow for efficient and error-free management of workflows. These features ensure that automated processes are conducted swiftly and accurately, enhancing overall efficiency.

### **5.3.1 RapidMiner - For Data Analysis and Modeling**

RapidMiner is a powerful tool for analyzing complex data sets and modeling. Its user-friendly interface and extensive function set make it effective for data mining and machine learning tasks. This tool directly contributes to the project's objectives in data analysis and predictive modeling.

### **5.3.2 DBeaver - For Database Management**

DBeaver, with its user-friendly interface and flexible configuration options, is the preferred tool for database management. Effective management and continuous updating of our database are key advantages provided by this tool. It supports the project's overall efficiency and data-driven decision-making processes in terms of data access and management.

## 6 Evaluation

In this section, we aimed to comprehensively analyze the results and main findings of our study. We will also try to address the effects of the results on the research objectives. RPA and Artificial Intelligence integration into business processes has shown remarkable effectiveness across various industries. This integration speeds up operations, reduces errors and increases efficiency. For example, in the banking sector, RPA has played a key role in repetitive tasks such as account reconciliations, while AI has contributed to more complex decision-making processes. The harmonization of these technologies has led to significant improvements in operational efficiency. However, there are also concerns about these technologies. One of the main concerns is the initial investment and complexity of implementation of these technologies, especially in legacy systems.

Additionally, there are challenges with data security and privacy when AI algorithms processing sensitive information are involved. In some cases, there may be resistance to change within organizations because automation may be perceived as a job security threat. When we consider human psychology, they may feel at risk of losing their job. These challenges require careful planning, stakeholder engagement, and robust security measures to ensure successful implementation.

Considering future goals, the continued development of these technologies promises greater advances in business process automation. As they evolve, they are expected to become more accessible and cost-effective for a wider range of businesses, including small and medium-sized businesses. The future of RPA and AI integration is shifting towards more intelligent automation, where AI will play a larger role in decision making and problem solving. To benefit from these advances, businesses need to focus on continuous training and development of their employees to adapt to these new technologies. However, while adapting to these technologies, keeping security measures at the highest level should always be a priority.

### 6.1 Analysis of Main Findings

**Quantitative Results:** The impact of RPA and AI applications on the process, such as increased efficiency in processing times, decrease in error rates or other measurable effects, has been observed. **Qualitative Results:** Qualitative results such as improvements in employee satisfaction and clarity of workflow should also be included in the evaluation. As effort and repetitive work decreased, employee productivity increased and employees who felt they adapted to technology began to feel better.

## 6.2 Comparative Analysis

The results will be compared to baseline metrics to highlight any improvements or advancements our solution offers. Below you can see the general robot speed-human speed comparison Table 4.

Table 4: Comparison of AI vs Human

| Job Description                   | Human Power | AI Power              |
|-----------------------------------|-------------|-----------------------|
| Division of labor                 | 30 min      | 2 min (expected)      |
| Database Reading                  | 10 min      | Few Seconds (2-5 sec) |
| Sending Mails                     | 15 min      | Few Seconds           |
| Database Updating                 | 10 min      | Few Seconds           |
| Reading mail by Business User     | 2 min       | Few Seconds           |
| Download files to relevant folder | 5 min       | Few Seconds           |
| Reading e-invoices (each invoice) | 3 min       | Few Seconds           |
| Creating report (each invoice)    | 1 min       | Few Seconds           |
| Sending report                    | 2 min       | Few Seconds           |
| Check report (each employee)      | 1 min       | -                     |
| Updating datatable                | 3 min       | Few Seconds           |

## 6.3 Critical Reflection

In our study, we found both expected and unexpected results. While some outcomes aligned with our predictions, others brought new surprises.

### 6.3.1 Limitations and Unexpected Outcomes

There were limits to our study, like the scope of the methods or tools we used. For example, the size or diversity of our data set might limit how much we can generalize our findings. Unexpected outcomes made us rethink some aspects of our project. These results highlighted things we might have missed in our hypotheses or methods.

### 6.3.2 Areas for Future Research

Our findings open up new opportunities for research, especially in how RPA and AI technologies integrate into business processes. Future studies could explore how these technologies work in different industry sectors. More research into how these technologies interact with human workers and affect job satisfaction could provide new insights. Using broader and more varied data sets in future studies could test our findings in a wider context. In conclusion, our study provides important insights into the use of RPA and AI in business, laying the groundwork for future research in these areas. Acknowledging our study's limitations and unexpected results not only strengthens its credibility but also opens up new questions and directions for further research.



## 7 Conclusion and Future Work

This thesis has taken care to reveal important aspects of the integration of RPA and AI technologies into business processes, and future studies will allow us to evaluate the potential of these technologies from an even broader perspective. Developments in this field will provide significant contributions for both the academic community and business professionals established in this field and pave the way for innovative applications. In particular, applications in the financial services, accounting, healthcare and insurance industries provide good examples of how RPA and AI can transform business processes.

In financial services, ANZ Bank’s implementation of RPA has reduced human effort by 85% and saved the equivalent of 400 full-time employees by automating processes from account reconciliations to mortgage processing to HR management. Additionally, by implementing RPA, TreasuryOne in South Africa has increased the direct processing rate of transactions to over 80% and reduced human intervention by 53%. Similarly, a leading bank in India has automated more than 200 processes using RPA, thereby improving customer experience by increasing productivity [Christiano, 2023].

In the insurance industry, Max Life Insurance has reduced human effort by more than 60% and increased compliance accuracy to over 99% by automating more than 160 business processes. A leading health insurer in the US reduced processing times by 80% and increased compliance accuracy from 92% to over 99% using RPA bots that automate new registrations, policy renewals, and billing[ciklum, 2023].

These examples show that the combination of RPA and AI increases the efficiency and accuracy of business processes, allowing them to more effectively navigate complex regulatory environments. The integration of RPA and AI is transforming business processes by not only automating repetitive tasks but also bringing decision-making and analytical capabilities. This integration increases the rate of data collection and verification while offering advanced features such as self-tuning algorithms and AI-based exception handling.

Research on the broader applications and interactions of these technologies will further deepen knowledge in this field. How RPA and AI systems can be applied in other industry sectors can be examined. In particular, research can be conducted on how these technologies can be adapted to specific needs in different fields such as healthcare, finance and retail. Applying this technology in different sectors can bring workforce utilization to more efficient levels. Additionally, there are studies examining the long-term effects of these technologies on businesses and society.

## References

- Paul Christiano. 45 rpa case studies in 2023 for different industries. *Expert Beacon*, 2023.
- ciklum. How do rpa and ai work together-benefits use cases. *ciklum*, 2023.
- Max Gotthardt, Dan Koivulaakso, Okyanus Paksoy, Cornelius Saramo, Minna Martikainen, Othmar Lehner, et al. Current state and challenges in the implementation of smart robotic process automation in accounting and auditing. *ACRN Journal of Finance and Risk Perspectives*, 2020.
- Amy Foshee Holmes and Ashley Douglass. Artificial intelligence: Reshaping the accounting profession and the disruption to accounting education. *Journal of Emerging Technologies in Accounting*, 19(1):53–68, 2022.
- Dariusz Jedrzejka et al. Robotic accounting: an rpa guide for accounts teams. *Zeszyty Teoretyczne Rachunkowości*, (105):137–166, 2019.
- Can Tansel Kaya, Mete Türkyılmaz, and Burcu Birol. Impact of rpa technologies on accounting systems. *Muhasebe ve Finansman Dergisi*, (82), 2019.
- Julia Kokina and Shay Blanchette. Early evidence of digital labor in accounting: Innovation with robotic process automation. *International Journal of Accounting Information Systems*, 35:100431, 2019.
- Marko Kureljusic and Erik Karger. Forecasting in financial accounting with artificial intelligence—a systematic literature review and future research agenda. *Journal of Applied Accounting Research*, 2023.
- Joydeep Mookerjee et al. A review of the robotic process automation’s impact as a disruptive innovation in accounting and audit. *Turkish Journal of Computer and Mathematics Education (TURCOMAT)*, 12(12):3675–3682, 2021.
- Lilian Ifunanya Nwosu, Makuena Clementina Bereng, Hester Vorster, and Tlotlo Segotso. Artificial intelligence and its effects on the accounting profession for future accountants: A systematic literature review.
- Chanyuan Zhang, Hussein Issa, Andrea Rozario, and Jonas Sveistrup Soegaard. Robotic process automation (rpa) implementation case studies in accounting: A beginning to end perspective. *Accounting Horizons*, 37(1):193–217, 2023.