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The Potential Benefits and Risks of Adopting RPA in the Banking Sector

Bachelor Thesis

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This is to certify that:

(i) the thesis comprises only my original work towards the Bachelor degree,

(ii) due acknowledgement has been made in the text to all other material used.

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Abstract

The banking industry's automation is a critical step towards digital transformation. This transition will not only save time, but also ensure that the service is impeccable. Robotic Process Automation (RPA) is a software technology that makes it simple to build, deploy, and manage software robots that mimic human actions and execute repetitive and time consuming tasks. This thesis tackles the benefits and risks of RPA adoption in the banking sector. Moreover, a qualitative research was conducted in order to identify the major challenges and risks that Egyptian banks may face when adopting an RPA solution. Our findings suggests the existence of 3 major challenges that employees seem to face when implementing RPA.

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List of Acronyms and Initialisms

AI   Artificial Intelligence

BPM   Business Process Management

COBOL   Common Business-Oriented Language

IOT   Internet Of Things

OCR   Optical Character Recognition

POC   Proofing Of Concept

RPA   Robotic Process Automation

Chapter 1

Introduction

In this chapter, we provide a brief introduction to this thesis by explaining the motivation behind it and the business problem that it attempts to solve. We also summarize the contributions made in this thesis, and explain how it is organized.

1.1   Motivation

Banking systems all over the globe are highly dynamic systems with thousands of processes and transactions taking place round the clock, and as the number of processes increase, it is going to become harder and harder on employees to manage these processes in an efficient manner. This is where Robotic Process Automation (RPA) comes in handy. RPA is considered as a disruptive technology in the financial sector as it greatly affects the productivity and efficiency of the banking systems by utilizing and leveraging the immense benefits of robots.

1.2 Contributions

We present our findings in this thesis after choosing to conduct a qualitative research using semi-structured interviews. Our interviews aimed to identify the major challenges and risks of RPA adoption in the Egyptian banking sector.

1.3 Organization

The thesis is divided into 6 chapters and is structured as follows: Chapter 1 provides an introduction to the topic while also discussing the motivation behind it and the organization of the thesis. Chapter 2 discusses in detail the banking sector and how digitalization has affected the whole sector. Moreover, it discusses the banking processes along with a few problems related to these processes that could potentially be solved by automation. Chapter 3 tackles disruptive technologies with a main focus on RPA along with its definition, its tools, ad its different implementations. The forth chapter discusses the potential opportunities and benefits as well as the risks of RPA adoption in the banking sector. Our fifth chapter tackles our methodology and dives into our qualitative research where all the findings are discussed. Lastly, we conclude the thesis in the sixth and final chapter.

Chapter 2

The Banking Sector and the Banking Processes

Over the past couple of decades, the financial sector and especially banks have been evolving immensely. With each passing year, new technologies emerge that help improve the banking processes making it much easier for the customers and for the employees as well. In this chapter, we will be discussing the impact of digitalization on the banking sector. Moreover, we will be discussing some challenges that banks face in their processes which can potentially be solved by automation.

2.1 Digitalization Era in the Banking Sector

Ever since the era of digitalization began, people's lives have significantly become way faster. Digitalization has been taking the world by storm and has emerged as a great tool to improve efficiency, increase productivity, and conduct faster and more frequent tasks and operations. Digitalization is steadily seeping its way through every sector and field in today's world, and of course, the banking and the financial

sector has not remained untouched. The old traditional banking processes have changed immensely and are continuing to change day by day due to the impact of digitalization [1].

2.1.1 Defining Digitalization

In order to understand how digitalization affected the banking sector, we first need to grasp the concept of digitalization. We will start by defining the term. Kitsios, Giatsidis & Kamariotou [2] defined digitalization as a process that combines 4 aspects which are information technology, connectivity technology, preexisting information and communication in order to improve a given process by altering its architecture and structure. In another article by Legner et. Al [3], they defined digitalization as "a term that is coined to describe manifold sociotechnical phenomena and processes of adopting and using technologies in broader individual, organizational, and societal contexts".

Parida, Sjödin & Reim [4] discussed in their article how industries are entering fourth industrial revolution (Industry 4.0) and that's all thanks to digitalization. Digitalization has revolutionized businesses in many different ways, most importantly, it helped industries become 'smart', that is done through many different technological tools including Internet of Things (IOT), predictive analysis, automation, and processes optimization. This technological transformation is looked upon as positive step towards something even bigger. For instance, according to recent BCG and PwC reports, this technological revolution and industry 2.0 is expected to grow and increase efficiency by 15-20 percent and make up around 20 percent of revenues over the next five years.

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2.1.2   Digitalization in Banking

The banking sector was not remained untouched from the waves of digitalization, but in fact, digitalization has been vastly spreading in banks and it has brought many benefits with it including shortening the time of many banking processes due to automation while also increasing their availability to the customers. Not only this, but also digitalization has helped in simplifying the processes of acquiring information about different banking offers, products, and many after-sales services [5].

In an article by Joshi & Parihar [1], they highlighted one prominent outcome of digitalization in the banking industry which is E-banking. E-banking has eliminated the need to visit actual banks in order to conduct normal banking transactions, instead, banking processes are now only a few clicks away. E-banking includes many automated services including ATM machines, Internet and mobile banking, electronic clearance service, and a lot more.

Technically speaking, banks generate very high volumes of documents across their many different processes and operations. These documents are mainly processed and managed through the combination of the organization's legacy systems, many manual processes, and other technological tools, this creates challenges such as adoption challenges, integration challenges, and retrieval challenges. Banking personnel struggle to integrate the multiple legacy systems that are utilized to manage and retrieve data, which can lead to inefficiencies and workarounds. Proper implementation of different technologies can help significantly in this problem [6].

Software and technology deployment is especially important in the financial industry. The financial industry's current IT infrastructure was created decades ago and has evolved in stages without a unified architectural design. Because each bank was primarily developing its own IT infrastructure, there is not a standard for implementation and contextualization. Therefore, start-ups cannot create a universal solution for all banks, but they often need to adapt innovation to the specific technical context of each bank. A major problem that is hindering the process of digitalization in banks is the outdated IT infrastructure of many financial institutes, and even though digitalization has brought so many benefits and has revolutionized the banking sector, yet this problem still lingers. One of the tools that has been helping the financial industry since the adoption of computers is Common Business-Oriented Language (COBOL), a problem-oriented programming language which was developed in 1959 as one of the first languages for programming business applications. COBOL works well with traditional core banking activities such as day-to-day payment processing, but it is very complex and unsuitable for integrating fast and flexible applications. While IT spending growth in the financial industry is still above average today, traditional banks seem to need to invest more to replace their existing IT infrastructure to keep up with the technological changes that's been happening in the world lately [7].

2.2 Challenges in the Banking Processes That can be Solved by Automation

Vishnu, Agochiya & Palkar [6] talked about how the banks and the banking processes are highly structured and how they consist mostly of predefined steps and

tasks. There are countless interactions taking place every day in banks which involve a great deal of different processes. These interactions can be:

- Bank to bank: processes involving opening new accounts, managing treasuries, organizing different loans between banks and wire transfers.

- Bank to customer: The processes include opening new accounts for customers, alter requests, solve problems, customer service and consumer communication.

- Bank to employee: The processes include tracking employee performance, HR benefit enrollment, the employee change of status and employees' travel, leave or resignations requests.

- Bank to government: The processes include filing for loans, different processes under compliance with government legislations.

Understanding the bank's capabilities and different processes and validating them will help the bank in clarifying how they can approach these processes to increase their efficiency and decrease errors.

2.2.1 Increased Errors in Back Office Operations

Al Balushi & Goel [8] discussed in their article how banks are always looking to enhance their operations and increase customer satisfaction by adopting many different technologies, yet they still have a lot of processes and operations that still depend on human input and papers. Usually, back office operations mainly require employees to process customers' requests manually. These operations include order processing, handling transactions, claims, and payments. Often, the different

transactions cannot be done equally on a daily basis and it might get delayed or combined with complex tasks which will eventually create problems such as bottlenecks and slow response to customers' queries. Moreover, bank employees deal with huge amounts of data and subsequent manual processes that are prone to include errors as the tasks bank employees have to perform are time consuming and somehow repetitive. Similarly, in an article by Aguirre & Rodriguez [9], they discussed how this high degree of manual processing in back office operations are costly and slow, and it can lead to inconsistent results and a high error rate. They also discussed how IT offers solutions that can rescue these back-office procedures from needless expense and errors.

2.2.2   Changing Business Models and BPM

Glykas et. Al [10] defined Business Process Management (BPM) as a set of methods, techniques, and tools for designing, measuring, and analyzing operational business processes. The need of constantly modifying processes, and organizational structures has increased in the last two decades due to the quick rate of change in market conditions. Performance measurement systems and other supporting managerial systems are always monitoring the success of this ongoing transformation. This constant shift has compelled many organizations including banks to start BPM initiatives in order to better their operations, despite the fact that BPM adoption can be a difficult undertaking.

In an article by Parida, Sjödin & Reim [4], they discussed how the latest changes in the banking sector has caused major shifts in the preexisting banking business models and business processes causing some challenges in business model

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innovations. These challenges include the constant need to deploy or use new technologies to help with the constant increase in demand. In addition to this, external factors affect business models greatly such as the Great Financial Crisis and Covid-19 pandemic. As new technologies emerge and as banks start to deploy and use the new technologies, new business models should be implemented and old ones should be revised in order to deliver value to the organization.

After discussing the banking sector and how banks were hit by waves of digitalization that affected how banks conduct their activities and operations, while also digging into the banking processes and how banks still seem to be facing some challenges that needs to be solved by applying the right automation tools, we conclude this chapter.

Chapter 3

RPA as a Disruptive Technology

In the third chapter of this thesis, we will be focusing on RPA. We will be discussing why and how RPA implementation in the financial sector is considered as a disruptive technology. Furthermore, we will break down RPA and define its components. Lastly, implementation examples of RPA will be discussed.

3.1   Disruptive Technology Definition

First off, in order to gain a better understanding of RPA, we need to give a proper definition to Disruptive technologies and give a few examples of technologies that are considered disruptive. So, what does disruptive technology actually mean and what falls under this term. According to Jorge, Mosconi & Cadieux [11], they defined disruptive technology as any technology that acts as a trigger to alter the nature of work, causing disruption or major changes in the environment it was adapted in.

In an article by Christensen [12], he defined disruptive technologies as sim-

ple innovations mainly consisting of already existing technologies or components, these components are put together in a different and unique manner which is often easier than previous existing approaches which eventually causes changes in the "rules of the game". Adding to these definitions, Kostoff, Boylanb & Simonsc [13] said that disruptive technologies are products or services built using specific technologies that can be new or preexisting but configured in a way that is much cheaper, having better performance, and more convenient to the user or the industry. Moreover, disruptive technologies have a huge impact on the industries they penetrate, or they sometimes even create their own industry and start a trend.

Hassani, Huang & Silva [14] talked about how blockchain is considered as a disruptive technology and they simplified what blockchain wants to achieve in a very simple manner. Basically, Blockchain aims to achieve decentralization, fast and real-time transactions taking place directly between users, it also aims to achieve transparency, integrity while keeping the anonymity.

Another example of a technology that is taking the world by storm these days and is being widely adopted is Artificial Intelligence (AI). First off, what is AI? In an article by Helm et al. [15], they defined AI as a technology that aims to make machines intelligent. More specifically, they want machines to exhibit human intelligence to perform tasks but in a much more efficient way. These tasks include evaluation of a huge amount of data in a short period of time, self-driving cars, and recommending videos based on watch history (YouTube, Netflix.,..etc).

SINGH [16] thoroughly discusses AI and how AI is a branch of computer science

that simply aims to make machines smarter. This is done by empowering different electronic components and electronic gadgets to perform activities that normally need humans or the intelligence of the humans to be done.

3.2 RPA Definition and Tools

In this subsection we will be tackling RPA in detail. From its definition, its tools and examples of ready customizable RPA software solutions to help us gain a better understanding of the different RPA components and tools that might be used. We will start by defining RPA.

In an article by Jovanović, urić & Šibalija [17], they simply defined RPA initially as a software that tries to emulate a working employee by automating all the repetitive and labor intensive tasks expected to be done by the employee. They also referred to it as the deployment of software technology in order to configure a 'Robot' that helps interpret data to process repetitive transactions, configure data in order to set off responses from other computer based systems.

RPA was initially created to make employees' lives easier, it aims to relief the employees of the repetitive and tedious tasks they are asked to do by designing a software technology tool that is based on algorithmic programmed robots which are configured in a certain way to act as an employee to perform various given tasks that would take the software much less time to perform[18].

The tasks that RPA can perform are countless, some examples of the main tasks that the RPA system can perform include: first and foremost, as mentioned in all

RPA definitions, RPA is mainly used to automate all the repetitive and frequent tasks. The effectiveness of the RPA systems depends mainly on the repetitiveness of the process. Secondly, RPA can also be used to automate tasks that are of a great Importance to the company as chance of error occurrence will be minimized. Moreover, RPA helps greatly in processing tasks that include a huge amount of data as a simple employee is prone to make mistakes as the amount of work increases. Lastly, RPA deals with tasks that don't require external and on the spot decision making. Any decision it will take must be strictly written and defined in its algorithm [19].

After giving a couple of definitions to RPA and understanding its meaning, now we will be discussing the main types of RPA tools which are commonly used in RPA implementations and the RPA softwares that have emerged lately in order to support RPA implementations that may need the bots to be smart. Any other tool can be segmented under one of these four tools. The First tool used is Cognitive automation bots, the Cognitive automation bots are smart bots that can handle data which is unstructured in order to effectively take a decision. The Second tool used is the different Self-learning tools which are tools embedded in the software that has the ability to analyze and dissect different human behaviors. The Third tool is Excel which is a basic tool for automation. Lastly, RPA can also include software bots that can have interactions with other software and systems [20].

RPA technology is not integrated into an organization's IT system. Instead, it stays on top, allowing the corporation to deliver a product rapidly and effectively
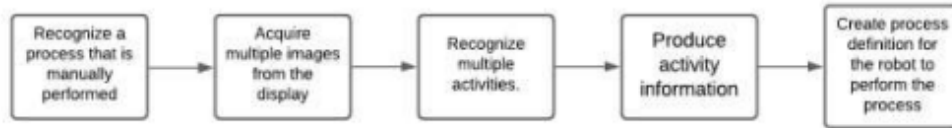
Figure 3.1: RPA working process [21].

without affecting its existing processes and infrastructure. RPA is a willingness to be aware of and it adjusts to changing settings, deviations, and new conditions that are not typical of traditional IT automation. If RPA software can detect and evaluate the behavior of current software applications for various procedures, it may control data, provide replies, initiate new activities, and communicate with other systems autonomously. RPA's work process is demonstrated in Fig. 3.1.

The process of RPA is as follows: first, guidelines and rules are given to the bots that tells them what to do at each given step. After having the processes programmed into the RPA, the system can then run the program and execute all the predefined tasks according to the different requirements for each process. The robots communicate with different frameworks through different integrations and screen scraping, allowing RPA to perform various activities [21].

In order to make RPA implementations easier and to make it easy for enterprises to adopt RPA solutions, there are many ready to implement RPA software systems that utilize the previously mentioned tools in addition to many more. There are three leading developers in the market for RPA implementations. These developers are: UiPath, Blue prism and Automation Anywhere. UiPath is the

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leader of the three and is widely known for having many sharable services and activities. It also has a rather easy and customizable robot design that can fit a wide range of tasks and activities. The resulting RPA software from UiPath can be hosted either on cloud or in virtual terminals, it is also characterized by having intelligent scheduling and intelligent execution. Lastly, it is compatible with many other commonly used technologies like SAP, PDF, Java, .Net, consequently, the integration won't be a hassle. As for Automation Anywhere, Automation Anywhere offers quite an interesting set of main features for the RPA implementation. These features include: firstly, it utilizes machine learning and cognitive functions in order to automate complex tasks in an efficient manner. Secondly, it has OCR commands which stands for Optical character recognition. Lastly, it includes technology which is based on Microsoft Platforms for easier integration with Microsoft applications. The last RPA software environment is the software designed by Blue prism. This software includes many desirable characteristics such as: being highly secure and easily scalable. Furthermore, it offers automation of different types of documents such as e Excel, XML, csv, pdf, images. It also offers automation for any software developed in java or Windows applications [17].

Regardless whether an organization chose to take the easy way out and buy a ready RPA software environment or they chose to implement everything themselves, the resulting RPA software is going to be installed on employees' computers and it is going to be deployed as a virtual assistant that will offer its help in order to automate the repetitive and time consuming tasks. In addition to having the RPA software installed on employees' computers, RPA can also be implemented on a much bigger central scale. The RPA software can be installed on the company's

IT environment, giving the company the chance to completely automate all of its processes and replacing human employees with the installed system [22].

3.3 Examples of RPA Implementations in Different Industries

Ever since the emergence of RPA technology, more and more industries and fields are beginning to show more interest in this technology and are slowly trying to integrate it in their systems and use it to their advantage. For instance, many logistics companies use RPA in order to organize their orders and deliveries. RPA processes huge amounts of data from different transport companies and links them with their customers. In addition to logistics, RPA is also starting to be used in human resource management. The system can search online for different resumes and CVs that match a specific job post with all the skills and requirements mentioned. If the system finds a suitable candidate for the job, the system can contact the candidate directly and send them an appointment with a recruiter, at the same time, the system also sends to the recruiter the details about the candidate and the appointment date. Moreover, the RPA system can also handle the accounting system of the company as it can alter information about employees' financial accounts according to the policies and the regulations specified by the company [19].

In another article by Alexovič et al. [23], they explained how RPA can be used in the pharmaceutical industry to achieve a throughput rate with a high sample, this is done by automating the sample pre-treatment in order to achieve greater accuracy, decrease waste of dangerous solvents and biologically risky materials.

Another field that is beginning to use RPA is the Electric and Energy Sector. According to Kumar et al. [20], RPA is used to collect a great amount of data from smart sensors that are installed in large power plants. The data collected from the sensors is then processed and utilized by the RPA system to generate numerous reports and charts, for example: charts of shift duty, reports for tariff, reports for load scheduling, or it can be used to generate fault reports.

After giving multiple definitions to RPA, mentioning examples of the tools used to create the RPA software and giving examples of some of the leading RPA software environment developers, as well as stating some RPA implementations in different fields. Now, one should be able to comprehend what RPA is and how any organization can implement it to make their processes run more efficiently and smoothly.

Chapter 4

RPA Benefits and Opportunities in Banking

In this chapter, we will be tackling RPA application in the banking sector. More specifically, we will be talking about the opportunities and benefits that RPA has to offer to the banking processes when banks implement RPA. In addition to this, we will also be talking about the risks that come with implementing an RPA system in such a sensitive and crucial field- the banking field.

4.1 RPA Benefits

RPA adoption brings to the table countless benefits that add so much to any organization that implements it. In this section we will be discussing some benefits of RPA system that will be brought to the organization that decides to implement this technology in their system.

4.1.1 Cost Saving

In an article by Patri [21], he mentioned how RPA is mainly used to automate processes and how this automation leads to the decrease in the number of employees as robots now do the job instead. Consequently, when employee number decrease, the costs that come with them decrease as well. While Yarlagadda [24] said that as work is done by the RPA system instead of employees, the output of work is expected to increase. So now, you have a greater output with significantly less employees and the organization is paying way less than before.

4.1.2 Availability and Scalability

Since RPA is technology deployed on servers and is an automated model with 24/7 presence, work is expected to be done round the clock without taking into account any holidays and day offs.[21] Another feature which RPA possesses is Scalability. Scalability is improved significantly when RPA is implemented as the system can easily scale up or down at any given moment to adapt to the amount of work incoming [6].

4.1.3 Increased Operational Efficiency

The last benefit of RPA systems we will be discussing is increase in the operational efficiency. When an organization first implements RPA, it demands coaching in the initial phases to be correctly implemented. But once we are past this phase, it is expected of the system to run smoothly with a better efficiency rate [25].Vishnu, Agochiya & Palkar [6] talked in their article about benefits of RPA, the first benefit mentioned was the significant increase in the operational agility and efficiency in the processes of any organization that implements an RPA system as the "Robots"

can be told exactly what to and can easily be programmed to be told exactly what do at any given moment, thus they are able to react in a very fast manner and adapt to any changes or requirement needed by the organization .

4.2 Business Opportunities that RPA has to Offer in Banks

RPA in banking serves as a very useful tool that addresses many problems that used to face banking prior to the digitalization era. Not only does RPA bring to the banks its well-known and desirable benefits, but it also brings to the table new business opportunities that will surely benefit the institute so much [25].

4.2.1 Improved Customer Service

Banks receive on a daily basis a huge amount of customer queries ranging from balance inquiries to customers' complaints that need to be answered. Customers nowadays demand fast and round the clock services as everything has been made easier due to digitalization. RPA is a great solution for banks to adopt in order to catch up with all the customers' demands as it will allow the bank to automate so many tedious tasks that come in with a huge volume. Moreover, it will allow them to significantly reduce the processing time of multiple queries and enhance the response time to customers. Adding to this RPA can help automate most of the repetitive replies resulting in the elimination of human input [26].

4.2.2 Fraud Detection

Banking organizations are concerned about a variety of fraudulent activities that might occur to them. They are extremely prone to security breaches and cyber threats. RPA helps in the process of fraud detection by maintaining a sophisticated system with top notch security levels that are long lasting and dependable. Automated fraud detection yields greater results than human fraud detection [25].

How exactly can RPA help in the process of fraud detection? In an article by Abdulla, Ebrahim & Kumaraswamy [27], they stated one possible way RPA can perform in order to detect any suspicious activity. It is done by tracking transactions and recognizing any suspected fraud transaction pattern, then RPA can track the source of this transaction, block the account in question and immediately stop the transaction.

Devarajan [28] also discussed another method of how RPA can help banks detect fraudulent activity. The detection occurs when RPA performs an "if-then" analysis on all incoming transactions done by customers and if one condition is not met and an anomaly is detected, the transaction is stopped.

4.3 Risks of RPA Adoption

Although there are evident success stories of RPA implementations, many institutions are facing serious issues. Hundreds of bots have been installed by some, with little to show in terms of efficiency and efficacy. Some have launched a slew of tactical pilots without a long-term strategy, causing confusion and scale issues [29].

Since RPA is software technology that needs to be configured on hardware devices in order to be used correctly, then its implementation surely comes with some challenges and risks. In an article by Yarlagadda [24], he mentioned some challenges and disadvantages that come with RPA implementations. For instance, monetary expenses might be high for some organizations to implement and follow up on the RPA system. Moreover, since RPA is configured, thus it needs a great deal of technical skill in order to be properly implemented and if there is no sufficient technical ability, the RPA will fail. In addition to this, one great challenge that scares most of the managers and CEOs is change. Adopting any new technology in any big company is considered as a major change that will surely cause disruption, but it is all in the hands of the people in charge to mitigate this change and adapt to it.

In a research conducted by Kamat [30], where he studied the effect of RPA adoption in the banking services and his findings included a list of challenges that are faced by banks that use RPA. Some of these challenges are:

- Challenges concerning privacy and data protection as banks deal with huge amounts of confidential and secure data round the clock, and RPA still has some security and privacy implications such as unintentional exposure of clients' personal data, hacking threats and device spamming. However, the literature suggests some measures to mitigate those challenges, as in [31, 32, 33, 34].

- Having to deal and comply with strict regulatory compliance issues concerning the banks and the financial sector with all the services they have to offer

which are highly regulated, where this problem is further discussed in [35] Consequently, dealing with a software that can somehow be considered as a 'Black Box' where all the processes are hidden, will cause some problems with the regulators.

- Having little people with full knowledge of RPA and how it should be utilized to reach its full potential. The challenge mainly lies in the great demand for RPA but the little supply that could be offered.

- RPA cannot be implemented as a standalone technology. In order to achieve maximum benefit and effectiveness, RPA should be accompanied by other cognitive solutions such as Artificial intelligence and machine learning. This will incur greater costs and may result in more technical issues. Previous literature have discussed the integration of RPA with other technologies as in [36], [37], and [38].

- Challenges may arise when integrating RPA with preexisting complicated IT architecture. Many banks are still using old legacy systems and software that have little to no automation tests built in them. Having to implement such automation in old systems may result in failure and collapse of the system. However, other literature claim that RPA's integration with legacy systems is rather easy, as in [39] and [40].

From discussing RPA implementations in the banking sector and how it aims to improve the processes with the various benefits and opportunities it has to offer, to the challenges and risks that come with its implementation.

Chapter 5

The Potential Challenges and Risks of Adopting RPA in the Banking Sector in Egypt

In this chapter, We will be discussing our methodology for this thesis. Moreover, we will present and further discuss our findings.

5.1   Method

Due to the nature of RPA as a relatively new topic in Egypt, we decided to use a qualitative approach to gather more detailed insights on the RPA implementations in Egyptian banks in an attempt to identify the major challenges and risks that banks might face when adopting RPA. Qualitative research aims to extract as much information as possible from rather a small sample size. It allows participants to express themselves freely while providing the needed data. The sample was selected through a purposive sampling technique using mainly 2 criteria:

- Having worked with RPA for a minimum of 6 months.

- Close involvement (developing, planning, testing) on RPA adoption in any Egyptian bank.

A total of 12 employees from different Egyptian banks were approached either on LinkedIn or through the phone. Eight employees from 5 different banks out of the twelve employees agreed to take part of our research. Details about the 8 participants are provided in Table 5.1 while info about the 5 banks are provided in Table 5.2. Our initial target sample might be small, but since RPA is a relatively new technology in Egypt and not enough banks work or have enough experience with it, we believe that we have reached the saturation point during these 8 interviews.

Semi structured interviews were carried out with the 8 participants as we felt that interviews will allow us to have an in-depth understanding of RPA as a new technology utilized in Egyptian banks. Moreover, interviews serve as a great tool to capture the participants' thoughts and views. The interviews were conducted over the phone with an average duration of 15 minutes each. Participants were mainly asked to identify the major challenges/risks that they face while working on RPA and offer potential solutions to overcome these challenges, as displayed in Table 5.3. All the interviews were transcribed and revisited for analysis to identify the most common trends.

Table 5.1: Participants guide.

Participants	Job title and duration worked on RPA
P1	Technical Analyst and currently leads the RPA project at B1 for 1 year
P2	RPA product owner for 7 months at B1
P3	RPA developer- Technical lead with more than 3 years of experience in RPA development
P4	Head of systems' development and automation and has been working on RPA for 1 year at B2
P5	Head of digital transformation and engineering with 3 years of experience with RPA at B3
P6	Head of Automation with 1.5 years of experience with RPA at B4
P7	Leads the RPA team at B5 and has been working on RPA for 6 months
P8	Digital Channel Specialist at B1 with almost 2 years of experience with RPA projects

Table 5.2: List of banks.

B1	Private Bank
B2	Private Bank
B3	Public Sector Bank
B4	Public Sector Bank
B5	Public Sector Bank

Table 5.3: Interview guide.

Topic	Interview Questions
Knowledge/Experience	Please State your Job title and how long have you been working with RPA.
Major challenges and risks	Identify the major challenges/risks that come with RPA adoption in Banks.
Solutions to overcome the challenges	How can you overcome these challenges?

Table 5.4: Summary of participants' answers.

Participants	Participants' answers
P1	-Resistance to change -Data Sensitivity -Data Security
P2	-Resistance to change -Data Security and technical problems to access the data
P3	-Limitation of RPA as a standalone technology -Data Sensitivity
P4	-Resistance to change -Difficulty to automate end to end processes
P5	-Processing of confidential data
P6	-Data Sensitivity -Not enough skilled people to work on RPA -A new technology
P7	-Finding a suitable vendor to automate your processes -POC and allocating enough time to research and test
P8	-Limitations of RPA as a standalone technology -Complexity and instability of banking channels and processes -Data Sensitivity

5.2 Findings and Discussion

Out of the 8 interviews conducted with the participants, we were able to identify 18 different challenges that arise when implementing RPA in Egyptian Banks, summarized in Table 5.4. On average, each participant identified 2 challenges that he/she encountered while working with RPA. It is worth noting that the participants are from different ranks and technical background/knowledge. So, it is expected to have varying responses as each participant tackled RPA from their point of view. This doesn't mean that there hasn't been any common points tackled, but on the contrary, we were able to identify 3 of the most common challenges that face most people who work on RPA within banking context. In this section we will be discussing those 3 common trends along with tackling a couple of other challenges that we deemed important to be tackled.

5.2.1 Data Sensitivity

The first major challenge that most of the interview participants identified is Data Sensitivity and how it poses as one of the biggest threats to RPA implementation in Egyptian Banks. Banks all around the world get to deal with sensitive and confidential data round the clock. Most of the processes in any bank involve sensitive data that needs to be processed with very high accuracy and very little error rate. That is why this poses as one of the biggest challenges for RPA adoption. P3, who is an RPA developer who has worked on different RPA implementations in different industries highlighted how developing RPA for banks differ greatly from any other industry.

"I have been working for B1 for a year and a half and we have automated around

29

10 processes so far. These processes include debiting and crediting account, open-ing account, and various other processes that need high execution accuracy. One of the biggest challenges we face is making sure that the process is executed as desired with a desired rate of 100 percent accuracy as the data in hand is sensitive and it is crucial to be correctly processed and executed."

P1, who is the RPA team leader who has been leading the RPA project at B1 highlighted how the nature of the banking data is very sensitive and you deal with tons of confidential data that need accuracy while processing.

"Our main goal is to try to automate most of the repetitive and time consum-ing tasks that take up so much time from human employees. The challenge lies in accurately executing the process and feeding the bots accurate data while handling as many exceptions as we can."

In order to try to avoid time-outs, termination of the process or executing the process incorrectly, P3 strongly suggests a long testing period where you try as many test cases as possible to handle any errors that might occur.

5.2.2 Resistance to Change

Any new change, especially if this change is aiming to reshape and revolutionize a predefined structure is frequently met with opposition. Employees may experi-ence considerable disruptions in their day to day responsibilities as a result of any changes that entail the adoption of a new technology [41].

Most of the participants have agreed that resistance to change poses as one of the biggest challenges of RPA adoption in banks as automation in general is still considered as a relatively new tool in the Egypt. P1 identified resistance to change as her number one challenge after B1 started using RPA.

"It has been almost 18 months since we started our RPA journey and up until this moment we still face some resistance from a lot of employees; this may be due to the lack of understanding of the technology in hand. Not a lot of people seem to get the idea behind RPA. In fact, some still think that a real life robot would come and sit on a desk to execute the tasks."

P2 added to the problem mentioned above by saying:

"Resistance to change is one of the major challenges that we face at B1. It is very hard to try and change the mentality of a lot of employees and make them embrace this change instead of resisting it. One of the main problems we face is that some employees don't trust RPA to execute some tasks. They don't want to take responsibility and work with what RPA produces."

It is apparent that this resistance to change is rooted from the lack of understanding of the technology. P4 pointed out that due to the lack of understanding of what RPA is, most of the employees think that RPA is here to replace them which is certainly not true. He further elaborated by saying:

"What makes resistance to change a big problem is that employees have this

rooted fear of being replaced by robots or machines. This makes it really hard for them to accept and embrace this technology and adapt to the changes that comes with RPA implementation."

It is clear that resistance to change is one of the main problems of RPA implementation in Egyptian banks, knowing how to overcome and maneuver this change would be the first step in ensuring the successful adoption of RPA.

P1, P2 , and P4 all agreed that in order to overcome this challenge, we must educate people about the various benefits of RPA by conducting different sessions and trainings highlighting that RPA isn't meant to eliminate the work of the employees. Instead, RPA will improve the work of people and the organisation as a whole. Ultimately, RPA is not meant to replace human workers but rather designed to make the working day easier and more productive for humans.

5.2.3   RPA as a Standalone Technology

RPA works great for automating high volume, repetitive, and rule based tasks. However, if any slight deviation from the scripted process occurs, the process may not be executed. The 'Robots' have limited cognitive abilities and skills. This may be considered as a problem when the input data is not carefully defined or contains null values as it cannot guarantee the successful execution of the process in hand. However, RPA is on the track of becoming more smart; various technology waves aims to make the bots smarter in order to be able to handle more unstructured data and complex tasks [29].

Many of the participants have mentioned this as one of the main challenges that they face when working with RPA. When RPA is implemented alone as a standalone technology in a very critical and data sensitive environment that is the banking sector, you're bound to be met with a lot of limitations and constraints. P3, who's an RPA developer highlighted this as one of the biggest limitations of RPA and his biggest challenge when developing the system.

"One of the biggest challenges I face as an RPA developer is how to find ways to make the bots smarter. RPA as a standalone technology is very limited; you need to predefine every step and handle the errors that might arise. An example of this limitation that I have personally faced and worked on is the Optical Character Recognition (OCR). Say we are automating a process that scans a report or a check and you need to verify and use its content. RPA on its own cannot do that, so you need to add an OCR software and set it up to work with RPA."

P6, who's the head of automation at B4 expressed his dissatisfaction with RPA for this specific reason. He elaborated by saying:

"RPA is great at doing 'dumb' work. It sure has saved us a lot of time and cut down on costs, but given the banking context; there are a lot of repetitive and time consuming processes that needs RPA but we still cannot automate them as they need more than just blindly following some steps. These processes need a little AI or machine learning in order for them to be executed properly."

5.2.4 Other Views

Data Sensitivity, Resistance To Change, and Limitations of RPA as a Standalone Technology are identified as the 3 most common challenges that employees face when working with RPA in banks. There are also other challenges that were identified by the participants that are worth mentioning and we will be discussing them briefly in this section.

P6 was concerned with how **RPA is a new technology** especially here in Egypt and there aren't many skilled people who develop and know the full range of RPA. He further elaborates by saying:

"RPA is seen as a very new technology here in Egypt and not many banks use RPA. In fact, we were from the very first banks that adopted RPA in our systems. This was considered as a challenge because the banking sector specifically is of a very special nature that needs accuracy, and even though RPA has great benefits, but we still struggle because we feel that we don't know its full capabilities and that not enough skilled developers work on RPA. We are all still learning about it."

P7 identified a very serious challenge which is **Proofing of concept (POC)** and **allocating enough time to research and test.** Proofing of concept is one of the very early steps a team leader or a manager takes in order to determine whether the project in hand would be feasible and fully functional or not. P7 added:

"Deciding to use RPA in your organization is not an easy task, You need to

allocate enough time to proof your concept and it is very crucial not to rush this process. Another important step is deciding which processes are going to be automated as not all banking processes can be automated using RPA."

5.2.5 Conclusions

The analysis of the participants' views showed 3 major challenges that any bank might face when choosing to automate some processes using RPA. We discussed those 3 trends which are: Data Sensitivity, Resistance To Change, and Limitations of RPA as a Standalone Technology. In addition to the 3 major challenges, we highlighted other challenges related to POC and novelty of RPA as a technology. Knowing how to approach the RPA implementation project and how to identify and mitigate these risks and challenges would be your first step in the successful RPA adoption in the banking sector which would bring to your organization many great benefits.

Chapter 6

Conclusions

There has been a spike interest in RPA and many industries have started investing in a proper RPA software to achieve many strategic objectives such as improving operational efficiency and cutting down on costs. The banking sector in Egypt realized how beneficial RPA is and how much time and money they are going to save by implementing the software. This thesis discussed the potential benefits and risks of RPA adoption in the banking sector after reviewing more than 25 articles discussing this topic. In addition to this, we presented our findings from conducting a qualitative study where we interviewed 8 participants from different ranks and different Egyptian banks in order to gain more insights on RPA projects in Egypt and try to identify the main risks and challenges one might face when choosing to implement an RPA software.

References

[1] D. Joshi and S. Parihar, "Digitalization & customer perception towards the banking services," *Aweshkar Research Journal*, vol. 23, no. 2, pp. 133–141, 2017.

[2] F. Kitsios, I. Giatsidis, and M. Kamariotou, "Digital transformation and strategy in the banking sector: Evaluating the acceptance rate of e-services," *Journal of Open Innovation: Technology, Market, and Complexity*, vol. 7, no. 3, p. 204, 2021.

[3] C. Legner *et al.*, "Digitalization: Opportunity and challenge for the business and information systems engineering community," *Business & information systems engineering*, vol. 59, no. 4, pp. 301–308, 2017.

[4] V. Parida, D. Sjödin, and W. Reim, *Reviewing literature on digitalization, business model innovation, and sustainable industry: Past achievements and future promises*, 2019.

[5] S. Kozak and B. Golnik, "Impact of digitization and mobile banking on the banking sector structure in poland," *Zeszyty Naukowe UPH seria Administracja i Zarzadzanie*, vol. 54, no. 127, pp. 5–11, 2020.

[6]   S. Vishnu, V. Agochiya, R. Palkar, *et al.*, "Data-centered dependencies and opportunities for robotics process automation in banking," *Journal of Financial Transformation*, vol. 45, no. 1, pp. 68–76, 2017.

[7]   B. Brandl and L. Hornuf, "Where did fintechs come from, and where do they go? the transformation of the financial industry in germany after digitalization," *Frontiers in Artificial Intelligence*, vol. 3, p. 8, 2020.

[8]   M. Al Balushi and N. Goel, "The development of robotic process automation (rpa) for the efficiency of back office operations at bank muscat," *Journal of Student Research*, 2019.

[9]   S. Aguirre and A. Rodriguez, "Automation of a business process using robotic process automation (rpa): A case study," in *Workshop on engineering applications*, Springer, 2017, pp. 65–71.

[10] M. Glykas, G. Valiris, A. Kokkinaki, and Z. Koutsoukou, "Banking business process management implementation," *International Journal of Productivity Management and Assessment Technologies (IJPMAT)*, vol. 6, no. 1, pp. 50–69, 2018.

[11] L. F. Jorge, E. Mosconi, and N. Cadieux, "Understanding digital transformation and disruptive technology impacts on bank managers' routine," 2019.

[12] C. R. Melchiorsen, N. B. S. Jensen, B. Christensen, K. Væver Jokumsen, and J. Villadsen, "Dynamics of pyruvate metabolism in lactococcus lactis," *Biotechnology and bioengineering*, vol. 74, no. 4, pp. 271–279, 2001.

[13] R. N. Kostoff, R. Boylan, and G. R. Simons, "Disruptive technology roadmaps," *Technological Forecasting and Social Change*, vol. 71, no. 1-2, pp. 141–159, 2004.

[14] H. Hassani, X. Huang, and E. Silva, "Digitalisation and big data mining in banking," *Big Data and Cognitive Computing*, vol. 2, no. 3, p. 18, 2018.

[15] J. M. Helm *et al.*, "Machine learning and artificial intelligence: Definitions, applications, and future directions," *Current reviews in musculoskeletal medicine*, vol. 13, no. 1, pp. 69–76, 2020.

[16] K. Singh, "Banks banking on ai," *International Journal of Advanced Research in Management and Social Sciences*, vol. 9, no. 9, pp. 1–11, 2020.

[17] S. Z. Jovanović, J. S. urić, and T. V. Šibalija, "Robotic process automation: Overview and opportunities," *International Journal Advanced Quality*, vol. 46, no. 3-4, pp. 34–39, 2018.

[18] H. Camo, S. Harnesk, and N. Grufman, *Implementation of robotic process automation: A case study of issues, challenges and success factors for rpa implementation in banking and financial services*, 2021.

[19] S. Yatskiv, I. Voytyuk, N. Yatskiv, O. Kushnir, Y. Trufanova, and V. Panasyuk, "Improved method of software automation testing based on the robotic process automation technology," in *2019 9th International Conference on Advanced Computer Information Technologies (ACIT)*, IEEE, 2019, pp. 293–296.

[20] K. Kumar, R. Shah, N. Kumar, and R. P. Singh, "Application of robotic process automation," in *Applications of Artificial Intelligence in Engineering*, Springer, 2021, pp. 929–937.

[21] P. Patri, "Robotic process automation: Challenges and solutions for the banking sector," *Prateek Patri, Robotic Process Automation: Challenges and*

Solutions for the Banking Sector, *International Journal of Management*, vol. 11, no. 12, p. 2020, 2021.

[22] J. Siderska, "Robotic process automation—a driver of digital transformation?" *Engineering Management in Production and Services*, vol. 12, no. 2, pp. 21–31, 2020.

[23] M. Alexovič, Y. Dotsikas, P. Bober, and J. Sabo, "Achievements in robotic automation of solvent extraction and related approaches for bioanalysis of pharmaceuticals," *Journal of Chromatography B*, vol. 1092, pp. 402–421, 2018.

[24] R. T. Yarlagadda, "The rpa and ai automation," *International Journal of Creative Research Thoughts (IJCRT), ISSN*, pp. 2320–2882, 2018.

[25] C Vijai, S. Suriyalakshmi, and M Elayaraja, "The future of robotic process automation (rpa) in the banking sector for better customer experience," *International Journal of Commerce*, vol. 8, no. 2, pp. 61–65, 2020.

[26] K. N. Kumar and P. R. Balaramachandran, "Robotic process automation-a study of the impact on customer experience in retail banking industry," *Journal of Internet Banking and Commerce*, vol. 23, no. 3, pp. 1–27, 2018.

[27] Y. Abdulla, R. Ebrahim, and S. Kumaraswamy, "Artificial intelligence in banking sector: Evidence from bahrain," in *2020 International Conference on Data Analytics for Business and Industry: Way Towards a Sustainable Economy (ICDABI)*, IEEE, 2020, pp. 1–6.

[28] Y. Devarajan, "A study of robotic process automation use cases today for tomorrow's business," *International Journal of Computer Techniques*, vol. 5, no. 6, pp. 12–18, 2018.

[29] R. Syed *et al.*, "Robotic process automation: Contemporary themes and challenges," *Computers in Industry*, vol. 115, p. 103 162, 2020.

[30] A. Kamat, "Challenges of robotic process automation adoption in banking and financial services," 2019.

[31] W. Alexan, A. Elkhateeb, E. Mamdouh, F. Al-Seba'Ey, Z. Amr, and H. Khalil, "Utilization of corner filters, aes and lsb steganography for secure message transmission," in *2021 International Conference on Microelectronics (ICM)*, IEEE, 2021, pp. 29–33.

[32] A. Samir, W. Alexan, R. T. ElDin, and A. El-Rafei, "3d steganography by random shuffling of image contents using residue model," in *2020 4th International Conference on Electronics, Communication and Aerospace Technology (ICECA)*, IEEE, 2020, pp. 912–918.

[33] M. T. Elkandoz and W. Alexan, "Image encryption based on a combination of multiple chaotic maps," *Multimedia Tools and Applications*, pp. 1–22, 2022.

[34] W. Alexan, M. ElBeltagy, and A. Aboshousha, "Rgb image encryption through cellular automata, s-box and the lorenz system," *Symmetry*, vol. 14, no. 3, p. 443, 2022.

[35] M. Romao, J. Costa, and C. J. Costa, "Robotic process automation: A case study in the banking industry," in *2019 14th Iberian Conference on information systems and technologies (CISTI)*, IEEE, 2019, pp. 1–6.

[36] X. Zhang and Z. Wen, "Thoughts on the development of artificial intelligence combined with rpa," in *Journal of Physics: Conference Series*, IOP Publishing, vol. 1883, 2021, p. 012 151.

[37] M. Smeets, R. Erhard, and T. Kaußler, "Looking to the future—the further development of rpa technology," in *Robotic Process Automation (RPA) in the Financial Sector*, Springer, 2021, pp. 137–141.

[38] P. Martins, F. Sá, F. Morgado, and C. Cunha, "Using machine learning for cognitive robotic process automation (rpa)," in *2020 15th Iberian Conference on Information Systems and Technologies (CISTI)*, IEEE, 2020, pp. 1–6.

[39] T. Taulli, "Robotic process automation (rpa)," in *Artificial Intelligence Basics*, Springer, 2019, pp. 91–102.

[40] C. Lamberton, D. Brigo, and D. Hoy, "Impact of robotics, rpa and ai on the insurance industry: Challenges and opportunities," *Journal of Financial Perspectives*, vol. 4, no. 1, 2017.

[41] A. P. Pokharkar, "Robotic process automation: Concept, benefits, challenges in banking industry," *IIBM'S Journal of Management Research*, pp. 17–25, 2019.