Ministry of Higher Education and Scientific Research

Higher National School of Management

Kolea

العلمي والبحث العالي التعليم وزارة

للمناجمنت العليا الوطنية المدرسة

القليعة

Graduate Dissertation

Presentation with a view to obtaining an academic master's degree in the specialty of

Management of Organizations

Feasibility Study on the Implementation of Robotic Process Automation in Business Processes of the Banking Sector

Case Study: Crédit Populaire d'Algérie

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Academic year

2023 - 2024

Abstract

This dissertation investigates the feasibility of implementing Robotic Process Automation (RPA) in CPA Bank's Monetics Management department and the integration into its business processes. A qualitative approach, including stakeholder interviews and document analysis, was employed to gain deep insights into the current operational landscape and organizational readiness for RPA. Literature is reviewed, and the conceptual framework of business processes and banking digital innovation is exposed, before detailing the methodological framework. Collaborative work with EY provided valuable information that guided a comparative study of As-Is and To-Be processes and a proof of concept exploring change, finance, and IT aspects. The comparative study showed that RPA could significantly enhance efficiency, processing tasks in seconds with 100% accuracy compared to the manual process prone to error. The proof of concept confirmed that automating specific processes is feasible with substantial benefits. An agile development plan outlined incremental RPA implementation sprints to ensure effective and gradual RPA implementation, highlighting the need for further studies and future development.

Key words: Robotic Process Automation (RPA), Business process, Bank, Digital transformation, Change management

Résumé

Cette thèse examine la faisabilité de l'implémentation de l'automatisation des processus robotiques (RPA) dans le département de gestion monétique de la Banque CPA et son intégration dans les processus métiers. Une approche qualitative, incluant des entretiens avec les parties prenantes et l'analyse de documents, a été utilisée pour comprendre le paysage opérationnel actuel et la préparation organisationnelle pour la RPA. La littérature et le cadre conceptuel des processus métiers et de l'innovation numérique bancaire sont explorés avant de détailler la méthodologie. Le travail avec EY a guidé une étude comparative des processus actuels et futurs et une preuve de concept explorant les aspects du changement, de la finance et de l'informatique. L'étude a montré que la RPA peut améliorer l'efficacité, en traitant les processus rapidement et avec une précision de 100%. La preuve de concept a confirmé la faisabilité et les avantages de l'automatisation de certains processus. Un plan de développement agile a été élaboré pour assurer une mise en œuvre progressive et efficace, soulignant la nécessité d'études supplémentaires et de développements futurs.

Mots-clés: Automatisation robotique des processus (RPA), Processus métier, Banque, Transformation digitale, Gestion du changement

ملخص

الجزائري الشعبي القرض لبنك النقدية الإدارة قسم في للعمليات الروبوتية الأتمتة تطبيق جدوى في الأطروحة هذه تبحث, لفهم الوثائق، وتحليل المصلحة أصحاب مع مقابلات تشمل نوعية، منهجية استخدام تم .التجارية العمليات في ودمجها للعمليات المفاهيمي والإطار الأدبيات استعراض يتم .الروبوتية الأتمتة لتطبيق المنظمة واستعداد الحالي التشغيلي المشهد "يونغ اند إرنست" الإستشاري المكتب مع العمل قدم .المنهجية توضيح قبل البنوك في الرقمية التكنولوجيا وابتكار التجارية التغيير جوانب استكشفت التي المفهوم إثبات ودراسة والمستقبلية الحالية للعمليات مقارنة دراسة أَرشدت قيمة معلومات تعالج حيث كبير، بشكل الكفاءة تحسن أن يمكن الروبوتية الأتمتة أن الدراسة أظهرت .المعلومات وتكنولوجيا والتمويل تنفيذ لضمان تطوي خطة وضع وتم العمليات، أتمتة وفوائد جدوى المفهوم إثبات دراسة أكدت .تامة وبدقة بسرعة المهام المستقبلي والتطوير الدراسات من لمزيد الحاجة على مشددة وفعال، تدريجي.

التغيير إدارة الرقمي، التحول بنك، تجارية، عملية للعمليات، الروبوتية الأتمتة **:المفتاحية الكلمات**.

Acknowledgments

First and foremost, all praise and gratitude belong to Allah, for his countless blessings and for granting me the strength and perseverance to complete this humble work.

I would like to thank my esteemed supervisors, Pr. Mustapha AMOKRANE and Dr. Leila MOHAMMED EL HADJ, for their guidance, advice, patience, and mentorship with this study. I would also like to extend a special thanks to Ms. AOUFI for her support and encouragement throughout this journey.

To my father, Youcef, my source of pride, whom deserves the most praise. This accomplishment is a humble tribute to his relentless efforts. From the youngest age, he nurtured my dreams, celebrated every step I took, and inspired me to reach for the stars. This achievement is as much his as it is mine, for it would not have been possible without him.

To my sweet mother, Nassiba. Her unwavering faith in me has been an eternal source of strength, motivating me to persevere through every obstacle. She is the embodiment of unconditional love and unwavering devotion. Her countless sacrifices are the driving force of my unshakeable desire to make her proud. Her selfless love, her belief in me, and her tireless efforts are the pillars on which my success stands. Words fall short in expressing the profound gratitude and appreciation I owe to my parents. Their encouragement and belief in me are behind every step I have taken, and every milestone I have achieved.

I would also like to express my gratitude for my sisters, Sarah and Khadidja, who are the constant sources of love, laughter, and motivation that have sustained me throughout this journey, and all of my life. And my precious nephew, Houssem, whose boundless energy and positivity have been a rejuvenating force, bringing a smile to my face, even on the hardest times.

Thank you to Ms. KASSALI, Mr. SNOUCI, and the personnel of CPA for the opportunity they gave me to conduct my study, and for the great environment in which they hosted me.

A special thank you to Sabrina, for picking me up every time I fall, and being there through every thick and thin, every laugh and cry, and cheering the loudest for me in every room.

To Amina, Marwa, my home away from home. Thank you for your support throughout this journey and for every magical moment we shared together.

Thank you to Issam, my companion and twin, for your deep consideration and for bringing comfort to my struggles. To Younes, for your continuous support and unwavering loyalty. To Nairouz for your countless lessons and sparkles. To Abdelbasset, for the positivity and laughs, Minet-Allah, my right hand, Islam, Nuur, Bouthaina, Rami, and Haydar. I am forever grateful for the profound gift of your friendship.

And finally, to Amine. Thank you for lighting the darkness and showing me the way. You have changed my life for the better.

"At the end of the day, they can say whatever they want to say about you, but they can't take it from you"

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List of Abbreviations and Acronyms

RPA: Robotic Process Automation

CPA: Crédit Populaire d'Algérie

MM: Monetics Management

EY: Ernst and Young

BP: Business Process

BPM: Business Process Management

IoT: Internet of Things

ATM: Automated Teller Machine

EPT: Electronic Payment Terminal

ROI: Return On Investment

ERP: Enterprise Resource Planning

FTE: Full Time Equivalent

CoE: Center on Excellence

POC: Proof Of Concept

ISO: International Standardization Organization

OTP: One Time Password

Introduction

Nowadays, clicks on machines is what banks are all about. Digital transformation in the banking sector is driven by the need to stay competitive, meet evolving customer expectations, and comply with increasing regulatory demands. Banks are transitioning from traditional methods to innovative digital solutions to improve efficiency, enhance customer experience, and provide more personalized services. This transformation involves the integration of advanced technologies into banking business processes. By adopting digital solutions, banks can offer seamless and faster services, ensuring higher customer satisfaction and retention. Furthermore, digital transformation allows banks to better manage risks and detect fraud through more sophisticated data analysis and real-time monitoring.

In essence, these operations underscore the pivotal role of business processes, serving as the bedrock upon which the entire banking landscape is built. From the initial stages of account opening to the intricate algorithms governing risk assessment, every transaction and interaction within the bank is meticulously guided by a complex web of interconnected processes. These processes are meticulously crafted to optimize efficiency, streamline operations, and ensure regulatory compliance, encompassing everything from transactional protocols to customer relationship management and beyond.

At the heart of these processes lies a commitment to delivering unparalleled service to customers while navigating the evolving regulatory landscape with finesse. They not only facilitate the seamless integration of advanced technologies such as artificial intelligence and blockchain but also empower banks to adapt swiftly to market dynamics, emerging threats, and customer demands. Moreover, these processes serve as the cornerstone of trust and reliability, ensuring that every interaction with the bank is conducted with the utmost security and integrity.

Indeed, it is through the meticulous orchestration of these business processes that banks can thrive in an increasingly digital world, offering innovative solutions, personalized services, and unparalleled convenience to customers while safeguarding their assets and interests.

Business processes in the banking sector encompass a wide range of activities essential for day-to-day operations and strategic management. Effective management of these processes is crucial for ensuring operational efficiency, maintaining compliance with regulatory standards, and delivering high-quality customer service.

In parallel to the broader spectrum of banking operations, the electronic payment department embodies a specialized realm where intricate business processes intertwine with cutting-edge technology to facilitate seamless monetary transactions in the digital realm. From processing online purchases to managing international fund transfers, the electronic payment department operates at the forefront of financial innovation, leveraging sophisticated algorithms and secure protocols to ensure swift and secure transactions across diverse channels.

Central to the functionality of this department are meticulously designed processes that govern every stage of the electronic payment lifecycle. These processes encompass a wide array of functions, each meticulously calibrated to uphold the highest standards of security, efficiency, and reliability. Every aspect of electronic payments is carefully orchestrated through a blend of automated workflows, real-time monitoring, and stringent compliance measures.

Moreover, as the landscape of electronic payments continues to evolve with the advent of new technologies and changing consumer preferences, the electronic payment department remains at the forefront of innovation. By continually refining and enhancing its business processes, banks can adapt swiftly to emerging trends, ensuring that customers have access to a diverse range of payment options while upholding the integrity of the financial ecosystem. Banks must continuously optimize these processes to reduce operational costs, enhance accuracy, and improve turnaround times. The complexity and volume of transactions, coupled with the need for strict regulatory compliance, makes these processes highly suitable for automation.

The rapid advancement of technology has fundamentally reshaped the banking sector, with automation playing a pivotal role in enhancing efficiency and reducing operational costs. Robotic Process Automation (RPA) is at the forefront of this transformation, opening doors and breaking barriers, offering significant benefits in terms of streamlining processes, minimizing errors, and enabling employees to focus on more strategic tasks.

Robotic Process Automation refers to the use of software robots or "bots" to automate highly repetitive and routine tasks that are typically performed by human employees. These tasks include data entry, transaction processing, and customer service activities, which are essential but often time-consuming and prone to human error. By automating such processes, organizations can achieve higher efficiency, accuracy, and speed, ultimately enhancing overall operational performance. The potential of RPA extends beyond mere automation; it involves rethinking and redesigning workflows to leverage the full capabilities of digital technologies.

The relevance of RPA in the banking sector cannot be overstated. Banks, like CPA, are under constant pressure to improve service delivery, reduce costs, and comply with stringent regulatory requirements. The ability to process transactions quickly and accurately is crucial for maintaining customer satisfaction and competitiveness in the market. Moreover, the integration of RPA can significantly contribute to risk management by ensuring consistent and error-free execution of processes.

The research question guiding our study is:

Can Robotic Process Automation be implemented in the business processes responsible for the electronic payment methods of Crédit Populaire d'Algérie?

To explore and uncover the key facets of this study, a number of sub-questions must be answered:

- Are MM business processes suitable for robotic automation?
- What is the current level of awareness and understanding of RPA within the department and the bank?
- What would the business processes look like after a robotic automation?
- What benefits can be realized by automating these processes?
- What challenges could stem from adopting RPA in this bank?
- What organizational changes are necessary for a successful RPA adoption?

Our study will investigate the feasibility of implementing RPA in the Monetics Management (MM) department of CPA bank, a step towards the bank's broader digital transformation strategy. From exploring the business processes within the MM department at CPA that are suitable for automation, to evaluating the potential benefits and challenges of RPA adoption, and developing strategies for effective implementation, our study seeks to understand how the introduction of RPA could transform the bank's operational processes, identify opportunities and challenges for employees, assess the financial implications of RPA adoption, explore organizational change management aspects, and delve into IT infrastructure considerations. By providing tailored suggestions for a successful RPA implementation project, our research endeavors to contribute valuable insights into the bank's pursuit of operational excellence through intelligent automation.

Methodology

To investigate the feasibility of implementing Robotic Process Automation (RPA) at CPA, a qualitative research approach will be employed. This methodology will involve conducting interviews with key stakeholders in the Monetics Management department, analyzing current business processes through document reviews and process mapping, and assessing the organizational readiness for RPA adoption. By leveraging qualitative methods such as interviews, observations, and document analysis, this study aims to capture rich insights into the complexities of automating specific processes and the potential challenges and opportunities associated with RPA implementation in the banking sector.

The utilization of qualitative tools in the study offers a nuanced and comprehensive exploration of the possibility of adoption, the organizational landscape and the potential impact of automation. Through in-depth interviews with key stakeholders in the Monetics Management department, we seek to uncover valuable insights into the intricacies of current business processes, employee perceptions of automation, and the cultural readiness for technological change. Additionally, observations of workflow dynamics and document analysis provide a holistic view of the operational challenges and opportunities that RPA presents. By employing qualitative tools, the study aims to capture the essence of organizational dynamics, enabling a deep understanding of the feasibility of integration and the factors influencing successful RPA adoption. This qualitative approach lays the groundwork for a thorough and nuanced study.

The collaboration with the Ernst & Young consulting firm serves as a cornerstone of this study on RPA implementation. EY's extensive experience and expertise in automation and digital transformation play a pivotal role in shaping the research direction, data analysis, and strategic planning for RPA adoption. By working closely with EY consultants, the study benefits from industry insights, best practices, and tailored suggestions to ensure a smooth transition to automated processes.

Structure

This dissertation is made up of three chapters:

The first chapter provides a literature review and conceptual framework addressing key topics related to the research. It discusses business processes in banking, highlighting their complexities and hierarchies. It examines the digital transformation in Algerian banking. Finally, it explores Robotic Process Automation in banking operations, outlining benefits, challenges, and best practices. The literature synthesis establishes a theoretical foundation for the study's subsequent exploration and analysis.

The second chapter presents the organizational context of CPA Bank and its Monetics Management department, utilizing internal data and documentation. It also outlines the methodological framework, including the research methodology, epistemological approach, and procedures employed.

The third and final chapter presents and discusses the results derived from the research we conducted at the MM department of the CPA bank, which encompasses a detailed analysis of some business processes identified for automation, evaluating their complexity, potential benefits, and challenges related to exception handling. It also explores how the introduction of RPA could transform the bank's operational processes and the key opportunities and challenges associated with this technological shift for employees, with a comparative study of the As-Is and To-Be processes. Additionally, the chapter delves into the financial implications of RPA adoption. Organizational change management aspects are also discussed in depth. The chapter also addresses IT infrastructure considerations. By presenting the research findings, data analysis, and strategic suggestions for CPA Bank, the third chapter aims to provide a holistic understanding of the impact of RPA implementation and the organizational transformations necessary for successful adoption.

CHAPTER I : Theoretical Framework

This chapter presents a comprehensive literature review and conceptual framework, covering the key topics related to our research. It starts by discussing business processes in the banking sector, highlighting their dynamics, success factors, and hierarchical structure. It then examines the digital transformation journey of the Algerian banking industry, driven by customer expectations and the need for operational efficiency. The review also delves into the role of Robotic Process Automation (RPA) in automating and optimizing banking operations, outlining its benefits, implementation challenges, and best practices. The literature synthesis covers numerous concepts and topics, and establishes a solid theoretical foundation for the subsequent exploration and analysis in our study.

Section 1: Literature Review

This section aims to provide a comprehensive review of existing research and work on banking business processes with its main success factors and dynamics, the digital transformation journey of the Algerian banking sector driven by customer expectations and the need for operational efficiency, and finally, the role of RPA in automating and optimizing banking operations. While trying to synthesize relevant research, we seek to establish a solid foundation for the coming exploration and analysis.

1.1. Banking Business Processes

(Nikolaidou, ANAGNOSTOPOULOS, & TSALGATIDOU, 2006) in "Business Processes Modelling and Automation in the Banking Sector" present a case study on modeling and automating the process of loan monitoring department in a med-sized bank. The approach of modeling processes with modified Petri nets (Modified Petri-Nets or MPN) and implementing them on the Lotus Domino/Notes platform, allowed for a complete formal description of dynamic activities that facilitated the re-engineering of the department and continuous process monitoring. Although the discrete event simulation advantages not exploited.

The article of (TRKMAN, 2010) titled "The Critical Success Factors of Business Process Management" published to the International Journal of Information Management aims to identify the critical success factors, both generic and case-specific, of Business Process Management (BPM) after establishing the underlying theoretical framework. The author proposes a unique combination of three theories; contingency theory, task-technology theory and dynamic capabilities theory. A case study in a medium-sized Slovenian bank results in identifying specific critical success factors related to strategic alignment, organizational changes, performance measurement, level of IT investment, process owners appointment, etc.

A criticism facing the study says that the theoretical framework remains general whereas the success factors may vary from one case to another, which requires repetitive exercises for the different organizations.

1.2. Algerian Banking Sector in the Digital Age

The research of (Derridj & Amiar, 2020) titled “Adoption du paiement électronique à l'ère de la transformation numérique : le cas du système bancaire algérien” aims to evaluate the state and growth of e-payment in Algeria, by using a quantitative approach based on the data collected from different Algerian banks. The study finds that e-payment usage remains low not reaching its full potential, despite efforts like the agreement of interoperability between the banks and the Algerian post, or the Covid-19 impacts. Traditional methods are conducted in most banking transactions due to a preference for cash transactions, low level of bancarization and, most importantly, the weakness in digital infrastructures and unequal access to digital services across the country, preventing the widespread adoption of e-payment.

(Soumya, 2023) in “The Digital Economy in Algeria – Prospects and Challenges” strives to assess the integration of digitalization into the different economic activities of Algerian banks hoping to catch up with technologically developed countries. The mixed methodology of quantitative and qualitative approaches shows the significant potential for Algeria to develop the digital sector with widespread adoption of electronic payment and exploitation of Big Data, and acknowledges the obvious challenges like the low development of innovation activities, and the lack of financing and support mechanisms.

1.3. Robotic Process Automation in the Banking Sector

The study of (KATKE, GOUD, & KAMAT, 2019) “Challenges of Robotic Process Automation Adoption in Banking and Financial Services” dives into the complexities that come with appropriating RPA in the banking sector and financial services, employing a conceptual research due to the nascent and growing stage of RPA, and analyzing insights of corporate entities undergoing said adoption and engaging with industry executives. The researchers study various adoption models and interact with key stakeholders to come up with a 7 step RPA adoption model fitting the banking sector and financial services industry. The authors categorize the findings into benefits and challenges to highlight the operational and economic advantages of the promised RPA adoption. They also emphasize the critical role of a center of excellence in managing the process of transformation, and the importance of studying the potential impacts of different internal and external factors, to ensure a smooth and successful transition into the automation world.

The study published on the conference paper by (ROMAO & COSTA, 2019) titled "Robotic Process Automation: A Case Study in the Banking Industry" investigates the benefits and risks using artificial intelligence (AI) in automating business processes, particularly RPA, in the banking industry. The study presents theoretical concepts relating to RPA, Business Process Management (BPM) and Business Process Automation (BPA). While the analysis provides the potential benefits such as the reduction of human errors and increased productivity, it also sheds light on the risks associated with immature AI models that could lead to incorrect or inexact decisions and non-permanent declines in productivity. The case study done at a Portuguese bank demonstrates solid examples of the theoretical framework and of the importance of striking the balance between benefits and operational risks related to the adoption of AI solutions in BPM/BPA

The research titled "Robotic Process Automation: Dynamic Roadmap for Successful Implementation," conducted by (SIGUROARDOTTIR, 2020), addresses the challenge of effectively implementing Robotic Process Automation (RPA) in organizations. The study employs a qualitative methodology, involving interviews with four experts experienced in RPA implementation. These interviews were semi-structured to allow for in-depth exploration of the critical stages and risk factors associated with RPA projects. The results of the study present a dynamic roadmap for RPA implementation, emphasizing the importance of proper process selection, comprehensive process assessment, effective change management, and the establishment of knowledgeable RPA teams to avoid failure. The research concludes that successful RPA implementation requires a structured approach to managing the RPA lifecycle.

The research of (JOVAN, MICHELIN, & RIANTORO, 2022) titled "Implementation of Robotic Process Automation: Audit Process, Workflow, and Competencies in Banking Firms" aimed to investigate the impact of Robotic Process Automation (RPA) on audit processes, workflows, and competencies in Indonesian banking firms. Employing a quantitative approach, the researchers collected primary data through questionnaires distributed to internal auditors in the top ten banks in Indonesia. The study utilized SMARTPLS software and structural equation modeling to analyze the data. The results revealed that Audit Process and Workflow significantly influenced the implementation of RPA, while Competencies did not show a significant effect. Additionally, when moderated by emerging technologies, the independent variables did not have a significant impact on RPA implementation.

After a review of the vast world of literature in the domains of Business Processes, the digital face of banks, the robotic automation of diverse activities in banking, it is no question that said territory captures the interest of many researchers and motivates the work of many geniuses in the fields. The diverse academic perspectives and treasury of research inspired our choice in the research theme. Which leads us to the next part of our research, the conceptual framework, that will allow for a better comprehension and direction of our investigation.

Section 2 : Business Processes in the Banking Sector

It is essential to have a transversal perspective of the activities of any company or organization that exhibits organizational complexity such as activity volume, size or departmental diversity. Resorting to the concept of business processes is empirical for business management and the mastery of organizational complexity. As (Champy, 1993) said: « Processes were not invented for us to write about them. Every company on the planet consists of processes. Processes are what companies do. »

A bank is a large and complex organization with many different departments and a high volume of activities. Therefore, the transversal perspective and process-oriented vision is just as important and relevant in the banking sector, and an integrated vision of key processes is essential for effective operations management.

2.1. Process

A process is an ordered sequence of tasks that follow a certain pattern and lead to a pre-determined result or end-point. The notion of a process could therefore be considered as a set of activities performed with a pre-defined objective by an actor corresponding to a specific role. The execution of a process operates with resources and can be conditioned by internal or external events, and the instrumentation of activities corresponds to the structure of the process.

We have found, after a thorough analysis of theoretical frames, that the most commonly recognized typology of processes distinguishes three categories according to (Debauche & Mégard, 2004):

- **Management or steering processes** whose job is to organize the strategic objectives of the company.
- **Support processes** that hold a smaller place of importance to the company's business and only indirectly participate in the achievement of a business objective.

- **Business processes** (or operational processes, realization processes) that hold the function of accomplishing a mission in a given domain or area and use multiple functions of the company.

A fourth category of processes can be grafted onto the explained types, called measurement processes.

- **Measurement processes** provide the necessary metrics for the evaluation and continuous improvement of processes.

2.2. Definition and Hierarchy of a Business Process

The definition of reference used today is given by the international standard ISO 19510:2013 that defines a Business Process as « one or multiple defined sets of activities that represent the necessary steps to achieving business objectives, including the flows and uses of information and resources. »

Business Processes are composed of multiple specific attributes, necessary for its mapping and for a better comprehension. It should be taken into consideration that the business process can be transversal. In fact, the latter can rely on several departments or, more generally, several organizations.

The business process includes the following components (REIJERS, MENDLING, DUMAS, & MARCELLO, 2018) :

- Event: represents a fact that occurs at a given moment triggering the start of an activity. This is often materialized by a piece of information.
- Activity: is defined as a set of tasks executed by machines and/or humans. These activities can be main activities, i.e. activities that create value for the customer, and support activities whose job is to facilitate, simplify and streamline the main activities.
- Resources: constitute the assets, either informational, material or financial, used by the activities.
- Actor: can be regarded as several entities such as an individual, an organization, a group, an application or a machine that takes part in the accomplishment of an activity.
- Objective: or the mission assigned to a process. This notion comes near to the notion of result or outcome, which is indeed true given that the consequence of each objective represents a result for the process, whether positive or negative.
- We can add other components, such as:

- Decision point: represented by an impact on the process path.
- Client: represents the one for whom value must be produced.

The objective of a business process is to provide a real vision of the profession and constitutes an excellent instrument for formalization and analysis (Softeam 2008). Indeed, possible improvement and optimization can be reached, based on this analysis, for existing processes by opting for new technologies or by applying different concepts such as "Lean Management".

Business processes can be categorized into 3 hierarchical levels (REIJERS, MENDLING, DUMAS, & MARCELLO, 2018) :

- **Strategic level**: This level is composed of the major process families of the organization that involve several functions/departments. These are transversal processes, for example: order process, new product development, delivery process or other processes englobing several functions.
- **Tactical level**: This level takes on the processes that are specific to each hierarchical line, such as the human resources management process, production process, logistics process or other processes that only involve one department or function.
- **Operational level**: at this level, we are talking about an elementary activity or task carried out to serve as a unitary entity necessary for the execution of a higher level process (strategic or tactical).

2.3. Internal and External Business Processes

Representation of business processes within an organization can be presented as a sequence of actions to be carried out to meet a determined business objective. These actions are synchronized through exchanges and performed by different actor.

Business processes within an organization are represented as a sequence of steps to be carried out to meet an identified business objective. These steps are actions performed by different actors and synchronized through exchanges. The business process creates value within an organization (EL CHERIF, 2014).

The business process of a company or bank can be internal (private) or external (public).

2.3.1. Internal (Private) Business Processes

Private Business Processes are designed to meet local needs and provide internal management services such as hiring or payroll processes.

These processes are activated within the same organization, which has complete control over the resources assigned to these processes and the application of individual activities. The majority of Business Processes are intra-organizational, that is especially true if we focus on value-adding processes that directly support the common goals.

2.3.2. External (Public) Business Processes

External processes include a number of partners. It is when a client or an application requires functionalities that no private business process alone is able to provide, such as e-Banking.

Processes between organizations are inbound or outbound processes; they are either triggered from the outside or result outside the borders of an organization.

In this area, two abbreviations are used for processes that cross the boundaries of their companies; B2B (business-to-business) as in processes between organizations, B2C (business-to-consumer) as in processes between the organization and a customer.

The following terminology can also be used:

B2G (business-to-government): processes between companies and government agencies.

C2C (consumer-to-consumer): processes between customers (online auction selling).

Inter-organizational processes can also be found if one or more activities of a process are performed outside of the control circle of the company, while a part of the process is externalized.

Business Processes represent the interactions between a private process and another or with another participant. Only the activities used to communicate with other participants and their execution order are included in the public process. Any other internal activities of the private process are not represented. Thus, the public process reveals to the outside world the messages and their sequencing necessary to interact with this process (ZUR MEEHLEN, 2004).

2.4. Reason Behind Automating a Business Process

According to (POWELL, SCHWANINGER, & TRIMBLE, 2001), the majority of an organization’s costs are generated by business processes. To improve the organizational efficiency, it is needed to improve the organization's business processes, as they strongly influence the product quality and the customer satisfaction, both of which are fundamentally important in the market (GRIGORI, et al., 2004).

This shows us several implications: a business process must be properly designed, its execution must be supported by a system that can meet the workload requirements, and the required work must be performable by the process resources in a timely manner (GRIGORI, et al., 2004).

(ZHOU & CHEN, 2003) shed light on an important point, claiming that for automated business process planning, there should be techniques supporting the analysis, modeling, and optimization of business processes.

According to (GRIGORI, et al., 2004), one of the latest trends in the literature is business process automation. The benefits of this automation are that processes can be performed quicker, at lower costs (due to limited human intervention), and in a controlled manner. However, as business processes become progressively automated, the industry is shifting away from utilizing these processes to focus on effective modeling, analysis, and optimization of business processes (VERGIDIS & TIWARI, 2008).

Section 3 : Evolution of the Banking Sector in the Face of the Digital Transformation

There is no doubt that, in our day and age, to properly execute their missions and tasks, employees feel the need to use digital tools in order to exploit the maximum potential of business processes for which they are responsible.

Furthermore, chance has no room to intervene when discussing digitalization. The banking industry has been one of the main precursors of technological innovation, and banks adopted and developed the digital tools very early on to optimize their key processes. Whether it be through digitalization of operations, automation of flow or integration of disruptive technologies like Artificial Intelligence (AI) and Blockchain, the players of finance have shown and led the way to digital transformation, and they continue to invest massively in innovation to remain competitive in the face of FinTech.

3.1. History of Digitalization

Digitalization has become a subject of major concern, and a strategic issue for all organizations regardless of their size or sector of activity. Actually, in barely fifteen years, the digital transformation has become reality to which many firms are turning.

These transformations are a sign of progress, the flow of information circulates rapidly and allows individuals to simplify daily actions. Many organizations are going on the IT ride to stay competitive enhance their profitability. (DUCREY & VIVIER, 2019)

Tracing the origins of digitalization, we find ourselves at the emergence of Internet. According to Christiane Waterschoot « The web is a major technology of the 21^{st} century. Its nature, its structure and its usage, which have evolved with time, force us to acknowledge that this evolution has deeply and profoundly modified our commercial and social practices ».

The Digital Evolution: This evolution has known three main phases: Web 1.0, Web 2.0 and Web 3.0 (PETIT, 2017)

- **Web 1.0** between (1991 – 1999): also known as traditional web, « First and foremost, it is a static web, focused on the distribution of information. », given the complexity of software at that time, the internet user was merely a simple recipient of information, unable to publish any content.
- **Web 2.0** (2000 – 2009): also called participatory web or social web, « It prioritizes the dimension of sharing and exchanging information and content. ». According to Béatrice Foenix Riou, director of BFR « The Web is no longer just a method of accessing documents, but is becoming a real IT platform, providing (…) applications to users ». In this phase, the Internet user is no longer just a spectator, but rather an actor with an active role and the possibility of expressing himself and being listened to.
- **Web 3.0** (Appeared in 2020); Semantic web « It aims to organize the mass of available information according to the context and needs of each user, taking into account their location, preferences, etc.… », we speak here of a convergence of geographic information systems, social networks and project management. And that's still not over yet, as Web 4.0 is at the doors « characterized as intelligent web it will aim to immerse the individual in an increasingly meaningful web environment. »

We can therefore say that Web 1.0 let us read, while Web 2.0 let us write, and Web 3.0 allowed us to connect.

3.2. Fundamentals of Digitalization

Digitalization is a process resulting from the evolution of innovative tools that aim to transform an object or a process into a computer code to facilitate usage and elevate efficiency. This is based on the combination of the significant potential offered by the Internet and the daily software advances such as AI and Internet of Things (IoT) (DABI-SCHWEBEL, 2018).

However, digitalization is not just about technology, because there is a very important human side, whether it is a new culture to be put in place, a new way of managing or a new approach to trades and processes (DABI-SCHWEBEL, 2018).

Digitalization is then the global transformation of the organization which aims to "capitalize on these new technologies to create value and benefit from new business opportunities" (DABI-SCHWEBEL, 2018)

In order to remain competitive, organizations are looking to modernize by taking the digital turn, involving a major change within the entire organization, from the business model to management methods. These challenges are defined on several levels (CORLAY, 2017):

- Work organization: The use of digital tools to improve team productivity and business performance becomes relevant. Some tools can automate repetitive actions to increase productivity and efficiency.
- Human Resources: With the arrival of "digital natives" on the job market, management methods are constantly changing. This generation does not share the same vision of management with their elders. Today, management must be more transparent and agile. In return, employees become more accountable and their engagement in the company is more noticeable.
- Simplification of information flow: By using a single communication network, information is more easily and rapidly accessible, which smoothens internal exchange.
- Information quality: In correlation with the previous point discussed, information that circulates quickly allows time savings on many tasks. The "everything, right away, anywhere" takes on value and can be synonymous with quality and differentiation.
- Information security: Digital data can be encrypted, with controlled accessibility under restrictions and the integrity measured.
- Material efficiency and sustainability: Reduction on the consumption of paper, materials, etc. promotes and leads to direct cost savings, on one hand, allowing budgets to be reallocated to other items; and also cultivates a positive image to the outside world and promotes sustainability, on the other hand, by reducing the environmental footprint of the organization, thus giving it an environmentally conscious perception.

1.3. Banking Sector, Pioneer of Digital Transformation

According to (BONS, RAINER, LEE, & WEBER, 2012), the banking industry is famous for intensive exchange of information, adopting information technologies very early on. This observation had already been made by Cooper and De Brentani in 1991, specifying that the banking sector is considered as one of the sectors most exposed to technological and IT upheavals.

In fact, the introduction of innovations in the banking and financial sector go as far back as the 1830s in the emergence of the telegraph. However, the true technological revolution, that shook up the banking and financial world back then, was the successful establishment of the first transatlantic cable in 1866 by the Atlantic Telegraph Company, and ultimately, a fundamental basis for an initial globalization of financial transactions at the end of the 19^{th} century.

Information systems were imposed in the 50s, and the actors of the banking and financial industry were among the first players to adopt through the automation of financial operations, daily management of administrative tasks, and accounting. This subsequently gave rise to the emergence of increasingly robust and rapid decision support information systems, with a high capacity for storing and processing information, thus facilitating strategic decision making for managers and people of power.

The early adoption of information systems by banks was crucial, in the sense that most human activities, particularly those in the world of finance and banks, heavily rely of them. The authors claim that said systems were originally designed as instruments for collecting, disseminating, treating and processing the information necessary for providing the organizational actors with the information needed at the right place and time to act effectively.

Nurcan and Rolland consider that, at this day and age, information systems have gone beyond that stage, to now become the depositories of the “savoir” and “savoir-faire” of organizations. The competitivity of a bank inevitably depends on the quality of its information system, reaching a point where it is completely impossible to function after a 48 hour disruption of said system.

Furthermore, the technological innovation that marked itself the most on the history books of banks is the introduction of the Automatic Teller Machine (ATM) in 1967 by the Barclays Bank. The implementation of this technology in banks has had such a huge impact that Paul Volcker, former chairman of the American Federal Reserve (1979-1987), said in 2009, in a commentary describing the role of financial innovation in financial crisis of 2008, that ″The most important financial innovation I have seen in the last twenty years is the ATM, which actually helps people and prevents trips to the bank, which is very practical”.

Additionally, the technological innovation is such a crucial matter to the smooth sailing of the financial and banking industry, that it’s always been one of the industries most investing in technological progress. In fact, information technologies represent the real engine of business development and can be used consequently in reinforcing and strengthening its competitive advantage, which has resulted in banks investing greatly into IT and prioritizing their digital transformation by top management. This statement is supported by statistics of banks in North America, Europe, Asia Pacific and Latin America that spent a total of 241 billion dollars in 2016 investment in IT with an increase of 4% compared to 2015, which remains quite significant as an investment by an industry in innovative technologies.

The advent of Internet, SmartPhones, ICT, Web 2.0 and the digital transformation have revolutionized the banking sector with the implementation of new remote and low-cost services through digital channels (E-Banking, M-Banking, Digital Banking…). Thus, a typology of innovations in the banking world had been presented by Karmarkar prioritizing services linked to new information and communication technologies, namely; Internet, mobile, mobile applications, online banking.. etc.

The said typologies focus on two axes :

- The method of access to the banking service:
  Centralized: the customer must present himself at the agency to benefit from the desired service (Managing your bank account for example.)
  Decentralized: the customer can have access to the various banking services remotely via smart phone or personal computer.
- The cost of access to technology: The customer can access these technological innovations without making a great effort and at the same time at low cost.

We saw it useful to summarize the major innovations in the banking/financial sector in the form of a table, in chronological order with the aim of having an idea as precise as it is useful on such an evolution.

Table 1. History of major innovations in banking sector

Time period	New technology/Innovation	Effect on the banking sector
1830s	Introduction of the telegraph	Basis for laying the first transatlantic cable
1866	Laying of the first transatlantic cable	Capital foundation for a first globalization of financial transactions
During WWI	Telegraph, railways, canals and steamboats	Rapid transmission of financial transaction and payment information around the world
1950s	- Appearance of the first credit card - Establishment of the first information system and introduction of the first computer in management	First automation of banking and financial operations
1960	First electronic data exchange	Easy and fast exchange of financial data
1967	ATM	Possibility of making financial and banking transactions without going through the bank branch
1967-1987	The telegraph transmission system becomes digital: first era	Gradual replacement of paper-based mechanisms by digital technology
1987-2008	Internet, online payment platforms by credit card, Smart phone, electronic wallet, E-banking.	- Digitization of financial and banking services: online transactions with a certain speed. - Possibility of managing bank accounts and financial transactions remotely by customers.
Since 2009	Crowdfunding, cryptocurrency, Fintech, Blockchain, artificial intelligence, Smart contract, connected objects…	Democratization and dematerialization of banking and financial services and ultimately, improvement in the rate of financial and banking inclusion.

Source. made by researcher

The continued adoption of technological innovations by the banking and financial industry has radically transformed the business model previously followed. This same industry is aware of the importance of integrating IT into their strategy; moreover, 33% of Goldman Sachs staff are represented by engineers, and that's on top of the engineers from LinkedIn, Twitter or Facebook. Paul Walker, global co-head of technology at Goldman Sachs, said on this subject that they "compete with start-ups and IT and technology service companies".

However, the economic crisis of 2008 significantly reduced customer confidence in their banks, which gave rise to new players using technology exclusively to offer useful, fast, secure and low-cost financial services.

3.4. Online Banks Have Transformed the Banking Sector

Online banks allow to carry out the whole banking operation or transaction online, without having to go to an agency.

Big time savior, online banks have added advisors available online or by phone in extended time slots going as late as 10PM and working 6 days out of the week. Which allows for busy or working people to obtain support after a long day of work.

In addition to these facilities, online banks challenge the pricing model of traditional banking establishments. Actually, the fact of not having a physical agency to spend money on, they operate with much lower fixed costs, which allows them to offer attractive prices with which traditional banks have found hard to compete.

Here, we have the example of BANXY, the first mobile bank in Algeria with a secure mobile account accessible from smartphones, anywhere and anytime, remote banking services available for everyone.

Section 4 : Automation of Business Processes Using Robotic Process Automation

Despite significant advances in digitalization, business processes consisting of activities (such as collecting, verifying and entering information) are still part of most businesses' lives. These activities are not only mundane and repetitive, but also sometimes very expensive. Furthermore, in firms, certain tasks are boring and require very few skills. However, they take up valuable time from the designated employees. In order to use this time more intelligently and ensure cost control, companies are turning to Robotic Process Automation (RPA).

4.1. Robotic Process Automation

Robotic Process Automation or RPA is a technology with the main job of automating manual and repetitive tasks that require human intervention, based on the use of artificial intelligence (AI) and Machine Learning. Software robots or more commonly referred to as ‘bots’ have the capability of imitating the human worker, and can connect to an application in order to manipulate and work of data, perform calculations, communicate with other digital systems, and even perform various tasks (KAELBLE, 2018).

The main objective of this technological resource is to liberate humans from boring and repetitive tasks, and allow him to invest that time and energy into more complicated activities with higher added value where the human presence is essential.

Furthermore, RPA also aims to increase productivity and improve feedback. It is now essential in companies and can be considered as a full-fledged support for strategy (DELOITTE, 2018).

The main advantage of Robotic Process Automation resides in the increased productivity, which translates into lower costs. Below are some of the specific benefits of RPA (KOFAX, 2019) (STRATILA, RONDIN, ITU, & STRANDAFIR, 2018):

- Operates 24/7: RPA workday doesn’t have a clock-out time and doesn’t end, therefore, Robotic Process Automation optimizes the return on investment (ROI) through enhanced efficiency.
- Easily integrates with existing systems: an RPA solution does not replace, but rather completes the existing systems. Re-engineering old processes is unnecessary since the robotic automation of processes is able to access data from a variety of sources, such as legacy, ERP and external systems, re-engineering old processes is unnecessary.
- Scales and expands with the business: To prove effective, an RPA solution must be able to adapt to a wide range of business needs and upgrade with the size of the business. It must also ensure process compliance and security, without local storage.
- Saves time for a busy workforce: Robotic Process Automation frees employees from repetitive tasks, for them to leverage their skills in scenarios requiring human intervention
- Eliminates human errors: Automation helps eliminate human errors and execute processes exactly the same every time, for more reliable and accurate results.

- Adapts to the Pace of Business: Not only do robotic automation processes generate data in near real-time in most cases, but the no-coding approach also accelerates system deployment compared to traditional solutions (a few days or weeks instead of several months). The interfaces are generally easy to learn and most do not require deployment by a developer.

4.2. Automation Requirements

Automation requirements represent the first step in business process assessment. During this phase, a judgment is made on the possibilities of automating a business process.

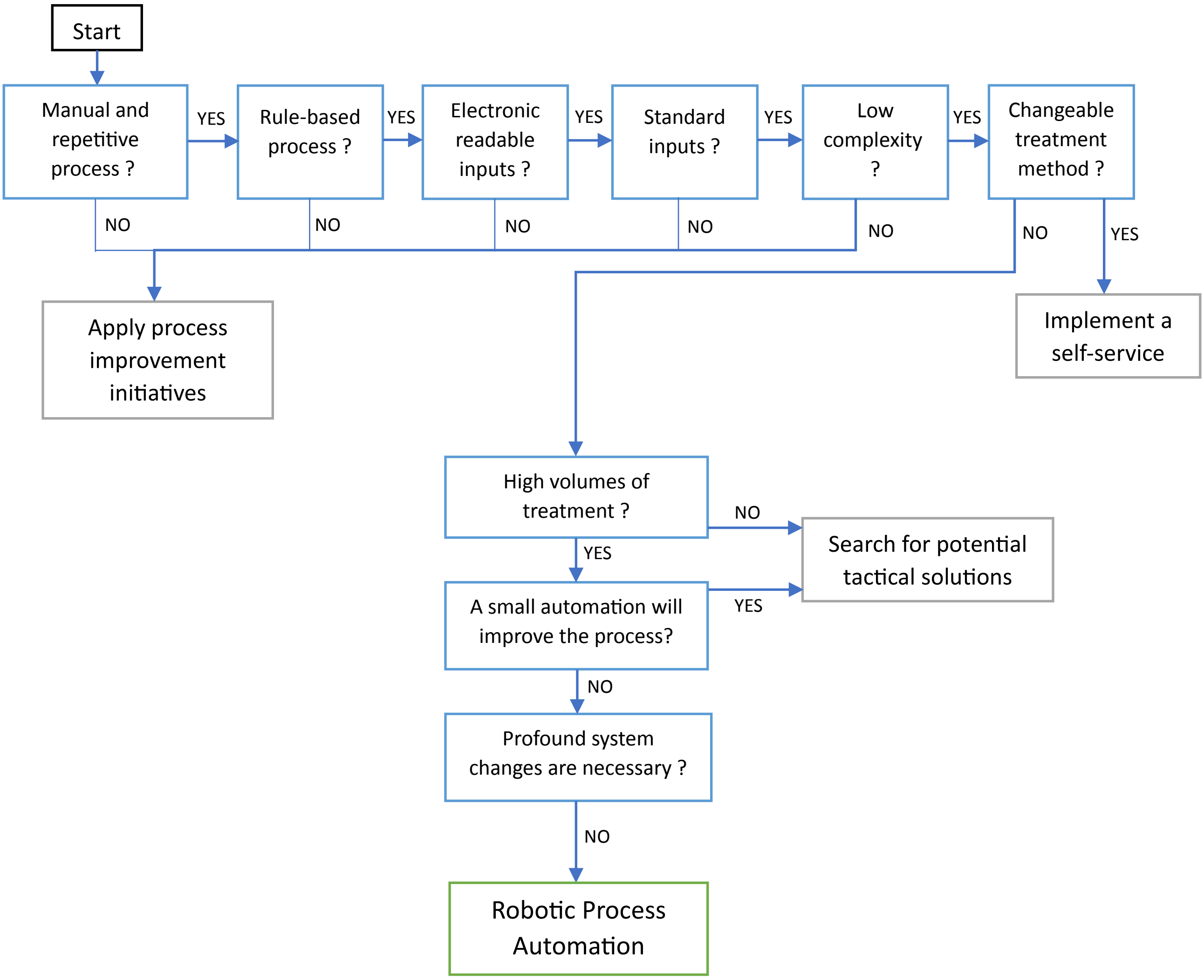
4.2.1. Guide to Choosing the Best Candidate Processes for Automation

The activities that lend themselves best to RPA generally have certain common characteristics:

- Large volumes: the number of cases to be processed must far exceed 100 iterations.
- Low complexity: low rate of exceptions, few special cases and few steps necessary to bring the process to fruition.
- Strong standardization of inputs.
- Clearly defined operating rules: the processes handled must be based on management rules.

Generally, when evaluating the possibility of automating a business process, the following algorithm must be used:

Figure 1. Guide to Choosing the Best Candidate Processes for Automation



Source. STRATILA Roxana, RONDIN Gregory, ITU Irina, TRANDAFIR Robert. RPA awareness. UiPath Academy, [Online] 2018.

Activities that meet these conditions often constitute the heart of the organization's processes. Therefore, these activities can be strengthened by automation technologies. These technologies are now sufficiently mature and are no longer reserved only for the "innovation" segment. The organization will thus be able to refocus its activity and resources towards tasks with higher added value (BENASSOULI, 2018) (LESHOB, BOURGOUIN, & RENARD , 2018).

4.2.2. Processes With High Automation Potential

The feedback accumulated over the last 5 years affirms that the processes with strong suitability for RPA are as follows:

- Rather manual and repetitive processes: Very frequent processes running daily, weekly (not monthly or annually, involving a lot of manual work or tasks prone to human error).
- Process with readable and standard electronic input type: Triggered by consistent and standard inputs. Inputs must be in readable form, such as: Excel, Word, email, XML, PPT, PDF, etc.
- Rules-based processes: Activities with clear processing instructions, with predictive, standardized rule-based decision making.
- Low rate of exceptions: Activities with a low number of variation scenarios in the process, leading to different processing procedures.
- Mature and stable processes: Documented, stable, predictable assets and known operational costs.
- Modifiable processing method or system change: The processing method cannot be changed.

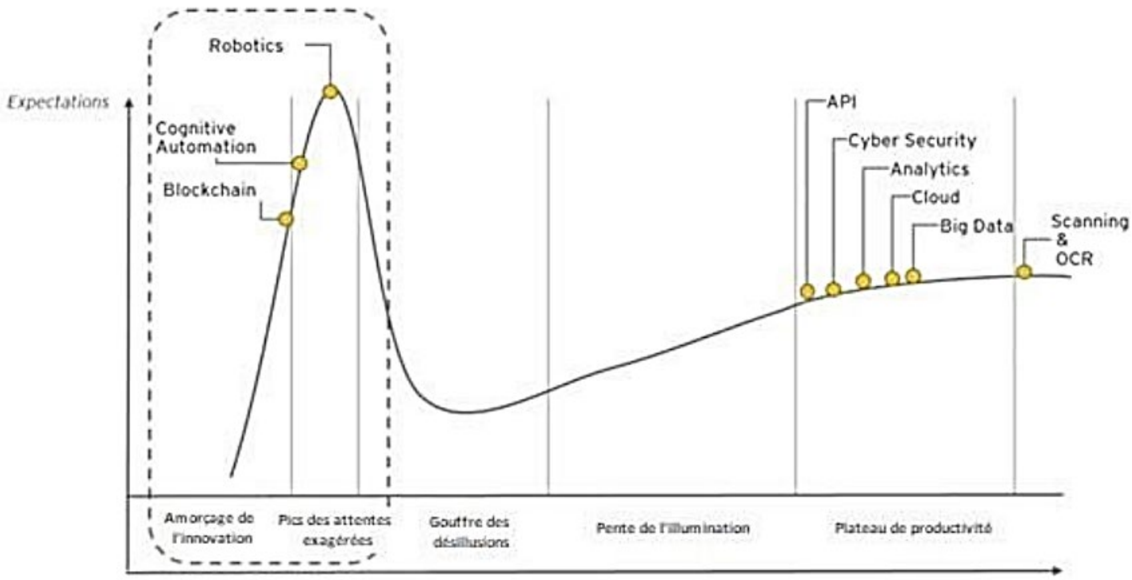
No fundamental changes are required in the underlying technical architecture of current systems (for example: development of a new interface or changes in the configuration of existing systems to enable automation).

It is recommended not to automate a process that is likely to be modified in the short term (LEOPOLD, HAN, & HAJO, 2018).

4.2.3. Choice of RPA Technology

Among all the promising technologies relating to the digitalization of business processes, RPA is undoubtedly the most favorable. To look at things from a broader perspective, RPA is the technology with the most impact, especially on business processes.

Figure 2. Gartner Hype cycle focus on promising technologies



Source. EY document

The figure positions RPA in the positive part of the Gartner Hype Cycle. Unlike proven technologies, promising technologies ensure rapid development within companies, and can create a certain competitive advantage (Internal EY Document, 2017).

4.3. RPA and Agile Methods

Considered as an IT development project, the implementation of an RPA solution is automatically founded on agile methods.

4.3.1. Definition of Agility

Agility is the ability to encourage and respond to change in order to best adapt to a turbulent environment (AUBRY, 2015).

Agility is the ability of an organization to provide services that impact its users early and often, while adapting in time to changes in its environment (AUBRY, 2015).

4.3.2. Definition of an Agile Method

An Agile method is an iterative and collaborative approach, capable of taking into account the client's initial needs and those linked to developments. This recommends setting short-term goals. The project is therefore divided into several sub-projects (IDEEMATIC, 2015).

4.3.3. Scrum Method

In RPA projects, the recommended method is Scrum for its flexibility and methodical approach that puts the organization at the center of development, thus creating a relationship of trust between the latter and the project team.

Scrum is defined as a lightweight framework, because it is not a complete process or even less a methodology. A process defines the way of working, while a process framework simply sets boundaries, that is to say, provides a framework (AUBRY, 2015).

Indeed, the Scrum framework is lightweight and only imposes a few things:

- Sprints and their events.
- A team with three roles: "Product Owner, Scrum Master, Development Team"
- A Backlog containing the work to be done.

Roles of Scrum Framework:

The Scrum Framework emphasizes teamwork, accountability, and iterative progress towards a well-defined goal. In Scrum, there are specific roles that ensure the framework functions effectively: (AUBRY, 2015) (IDEEMATIC, 2015)

- The Product Owner (or "Product Director"): the person on the team, and the only one, who is accountable for the results of the product with stakeholders.
- The Product Owner defines the content of the product. To do this, it's a must to identify the required functionalities, collected from stakeholders and put into a list, called a backlog. On the other hand, it is he who defines the milestones of the product life cycle.
- The Scrum Master: is a person in the Scrum team who puts himself at service, to facilitate the completion of the work requested by the Product Owner, by applying Scrum as best as possible, taking into account the context of the organization.
- The operational team considered to create value, the particularity of a scrum team is that it is devoid of any internal hierarchy. A scrum team is self-organized.

Working Principle:

Scrum applies in particular to the development of products (or services or applications or systems). Its operating principle is broken down into the points below: (AUBRY, 2015)

- People work in well-defined teams.
- Development is punctuated by a series of short iterations which are called sprints.

- Product features are collected in the backlog.
- The content of a sprint is defined from the backlog, taking into account the priorities and capacity of the team. From this content, the team identifies the necessary work and commits to the sprint objective.
- During a sprint, synchronization points are carried out every day. This daily inspection allows adjustments to be made as a team to ensure the success of the sprint.
- At the end of each sprint, the team presents the increment they added to the product during the sprint. Its evaluation and the feedback collected make it possible to evolve the definition of the product currently being produced. The improvement also concerns the way of working in a team.

4.3.4. Importance of Agility in RPA Projects

The team rarely goes off topic because this method ensures good and constant communication between the client and the company. As a result, during the development of RPA projects, agility will significantly reduce the risk of changing scope, documentation is reduced, thus efficiency in terms of productivity is increased.

Another strong point of developing RPA projects in agile mode is that a functional version of the program fragment is delivered gradually, thus providing the organization with good visibility on the progress of the project.

Unlike the traditional waterfall method, the Agile approach offers greater flexibility and better visibility in RPA project management. (GALIANA, 2017) (IDEEMATIC, 2015)

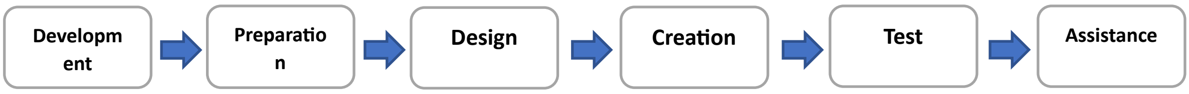
4.4. RPA Projects

Implementing RPA in a business follows a certain number of steps. (WILLCOCKS, LACITY, & CRAIG, 2015) broke down an RPA project into 6 phases. These steps, schematized in the figure, are as follows: (WILLCOCKS, LACITY, & CRAIG, 2015)

- Development: a stage characterized by the establishment of the infrastructure, that is to say the installation and configuration of the robot software, as well as the design of the server architecture.
- Preparation: focused on the governance of the project, at this phase a development implementation approach is put in place.
- Design: in this phase the process design file is prepared, as well as the formulation of the solution.

- Creation: Development of processes and performance of unit and functional tests
- Test: the purpose of this step is the validation of the development code and decision-making on the deployment of the robot in the production environment, through the execution of test cases and the analysis of the communicated results.
- Assistance: support for the progress of processes and management of change and improvements.

Figure 3. Life Cycle of an RPA Project



Source. Willcocks, Leslie, Mary Lacity, et Andrew Craig. Robotic Process Automation: Strategic Transformation Lever for Global Business Services, 2017. Journal of Information Technology Teaching Cases: 17-28.

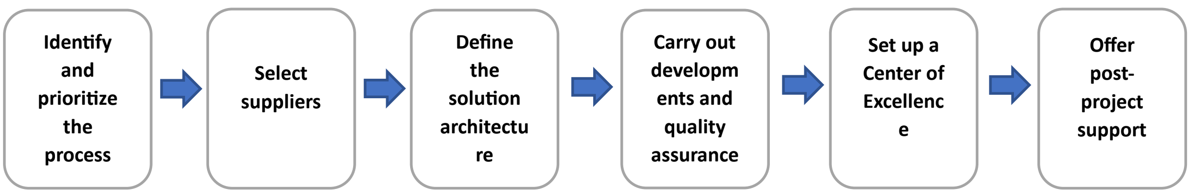
4.4.1. Methodology for Implementing an RPA Solution

In order to structure the process of implementing an RPA solution, the consulting firm Ernest &Young also offers a methodology inspired by experience acquired in the field.

The proposed methodology is divided into 6 phases and is supported by an agile approach. (Internal EY Document, 2017)

The figure presents the six phases of the process.

Figure 4. Implementation Process of an RPA Solution



Source. Internal EY document

Phase 1: Identify and prioritize processes

During this stage, an evaluation over 3 phases is recommended in order to highlight the RPA value source of the target company.

At the beginning, the evaluation will focus on the conditions for automating the company's business processes. The results from this first evaluation will make it possible to identify the processes concerned by the automation project.

The two evaluations that follow will be based on 2 axes, a benefit axis and another complexity axis, which will allow the prioritization of business processes.

When evaluating at the organizational level, three essential indicators are used:

- The first concerns the complexity of a process which can be low between 0 and 30%, average between 30 and 60% or high more than 60 percent.
- Full-time equivalent (FTE) savings: this criterion refers to the number of human resources allocated to a given process.
- Automation quadrant whose determination depends on the complexity of the process and the potential benefits "high, medium, low", in the automation quadrant the processes are divided between "quick win, accessible opportunity, necessary improvement and improvement to long term".

The business analyst must develop a strategy to prioritize processes, for this he must understand the complexity factors and the level of complexity of the processes expressed as a percentage.

To assess RPA potential and implementation complexity, in the EY methodology, 22 criteria are used for in-depth analysis and only 12 criteria for high-level analysis. The table presents the criteria used in the evaluate on process.

Table 2. Complexity and RPA Potential Criterias

Criteria – RPA Potential	Criteria – Complexity of Implementation
1. Rules-driven process	1. Number of IT systems used
2. Number of FTEs	2. IT systems technology
3. Availability of electronic data	3. Availability of process documentation
4. Frequency	4. Level of process standardization
5. Human judgment	5. Number of steps in the process
6. Error rate	6. Data quality (validation check)
7. Process continuity	7. (Un)structured data sources
8. Data sensitivity	8. Number of technical exceptions
9. Volumes	9. Availability of experts
10. Current level of automation	10. Level of process optimization

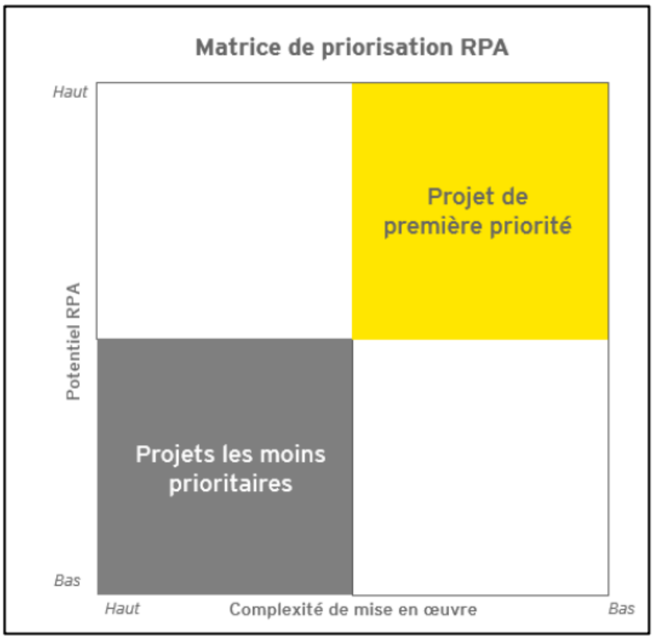
11. Turnaround time and service level 12. Variation of activity	

Source. Internal EY Document

A thorough assessment fully covers the potential and complexity criteria at the lowest level of processes. While the high-level assessment partially covers one or two high levels of processes. The choice of the type of evaluation depends significantly on the uncertainty, the risks linked to the processes, as well as their maturities.

After the weighting of the Criteria, comes the phase of prioritizing the processes eligible for RPA, using the Prioritization Matrix.

Figure 5. RPA Prioritization Matrix



Source. EY Internal Document

Phase 2: Select suppliers

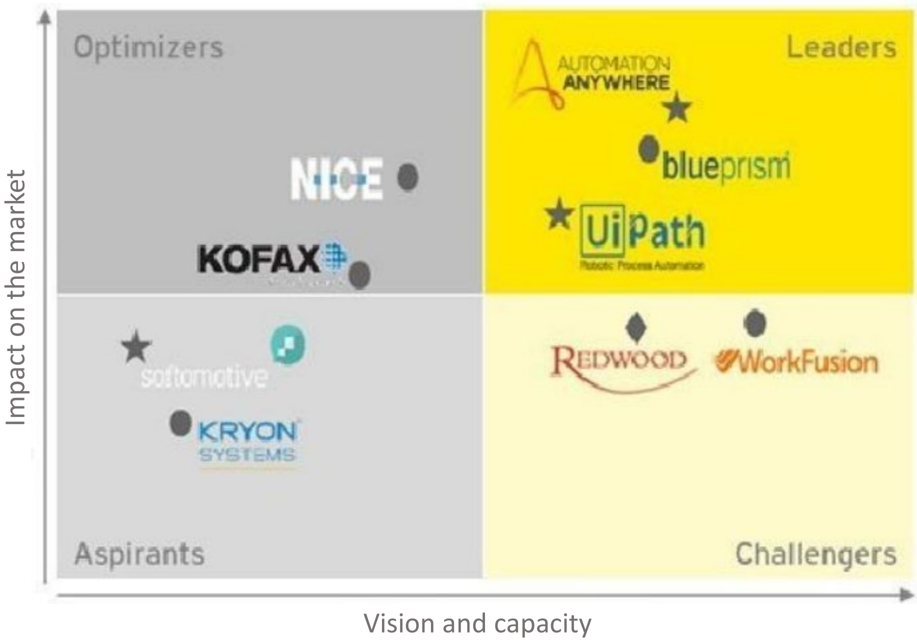
At this stage of the implementation process, the choice of robotization software is a crucial step, because selecting the right supplier with the solution adapted to the process is one of the key factors for the success of the implementation. The points generally studied at this level are as follows:

- Technology adapted to the business,
- “Optical character recognition” present in the solution
- Ready-to-use integration,
- Unattended automation,
- Company structure.

A comparative study between suppliers was carried out, based on the criteria provided by the suppliers and the position of each of them on the market. (Internal EY Document, 2017)

The following figure puts into perspective the positioning of RPA providers in the global market.

Figure 6. EVEREST GROUP - RPA fit matrice 2016



Source. Internal EY Document

The proposed study is based on an analysis by the consulting firm GARTNER carried out on the functional capabilities of the different tools, according to:

- Characteristics,
- Web automation,
- Excel and PDF automation,
- Database automation,
- Web data extraction.

The following table presents the results of this study.

Table 3. Comparative Study of the 3 Leaders of the Market

	AUTOMATION ANYWHERE	**BLUEPRISM**	**UIPATH**
Strengths	-3 types of recorders (tasks, web and Windows Object) which capture the task to be accomplished and reproduce it on other machines. -Error rate close to 0 when performing tasks with or without supervision. -Quick visualization of return on investment -High level of security with or without supervision	-Strong ability to quickly understand the need for robotization -Implementation times and deployment of robotic processes better than average -Preservation of data integrity without any intrusion into source systems -Based on applications already present in the company	-Centralization of logging, reporting and auditing tools; -Existence of a "staff bot" -Possibility of remote access and configuration -Non-intrusive robotization -Improved OCR functionalities
Weaknesses	-Works only with Internet Explorer -Incompatibility with Citrix (being resolved)	-Works only with Internet Explorer -Important process documentation (many deliverables)	-Requires knowledge in computer development, in code for certain settings -Newest on the market

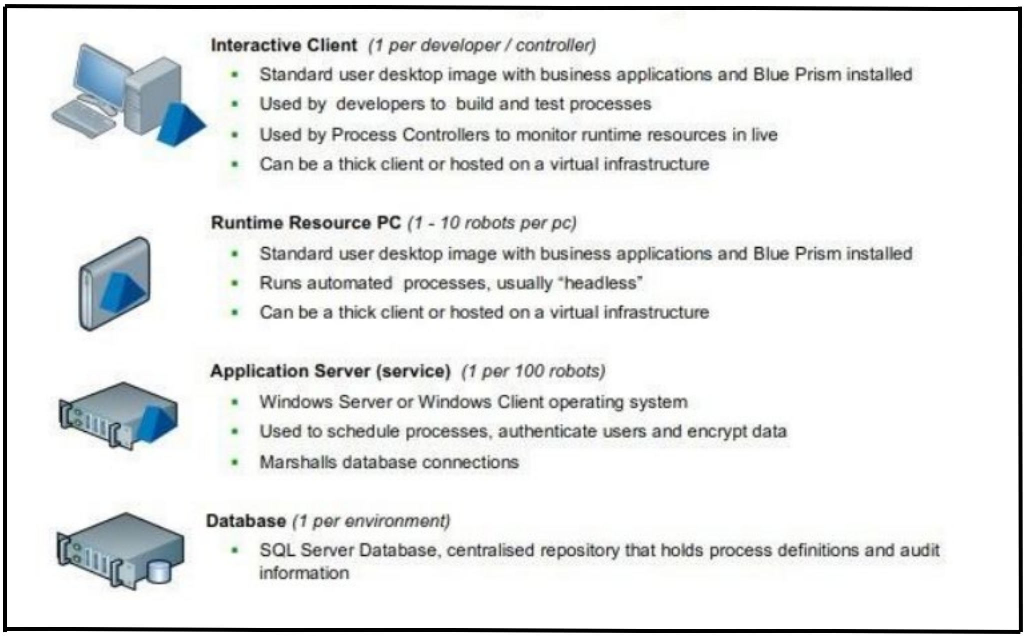
	-Weakness of OCR in character recognition	-Difficulty operating with PDF formats, inability to read image files -Incompatibility with Citrix	

Source. EY Document

Phase 3: Define the solution architecture

This phase represents the foundation of the entire RPA implementation. During this stage, the infrastructure team will define the server architecture, analyzing deployment options, undertaking installation and configuration, and creating environments respectively dedicated to development, testing and production. The following figure shows the components of the RPA technical infrastructure.

Figure 7. The components of the technical infrastructure of RPA



Source. Willcocks, Leslie, Mary Lacity, et Andrew Craig. Robotic Process Automation: Strategic Transformation Lever for Global Business Services, 2017. Journal of Information Technology Teaching Cases : 17-28.

Phase 4: Carry out developments and quality assurance

From this implementation phase, the project is carried out in iterative mode, that is to say in agile mode, with a product manager, a scrum master, sprints lasting from 1 to 3 weeks and meetings daily where each team will present their progress and difficulties.

During the piloting and deployment phase, a standard team structure is put in place, in this phase the project is managed by the business analyst and the solution architect with strong support from the information system department.

Phase 5: Establish a Center of Excellence (CoE)

This stage of the process is characterized by the use of change management, where EY will transmit its knowledge and expertise to the CoE in charge of RPA processes. The implementation of the CoE generally goes through three phases:

- Initialization “Initial knowledge transfer”: a stage consisting of the implementation of project governance and performance indicators.
- Industrialization “Knowledge transfer”: where the leadership of the center of excellence is entirely dedicated to developing RPA processes within the company. And the management of the RPA program is mainly internal to the organization.
- Institutionalization “Use of knowledge”: the CoE will be in charge of proposing technological developments across all company processes

Center of Excellence features and types:

Being a long-term skill, RPA aims to enable businesses to scale strategically and increase their business value. To achieve this goal, companies must develop, as part of their RPA experience, internal, autonomous and scalable expertise to operate and manage robots. A Center of Excellence is primarily the means to integrate RPA deeply and effectively into the enterprise and to redistribute the accumulated knowledge and resources in future deployments.

In addition, the CoE has the following functionalities:

- To gradually expand robotic processes.
- To maintain robots in operational condition and supervise them.

There are several CoE models, which can take the form of a centralized delivery model, as well as one in which the CoE authorizes other divisions to create their own CoEs within a framework defined by a central CoE, or completely independently. (STRATILA, RONDIN, ITU, & STRANDAFIR, 2018)

Figure 8. Types of Centers of Excellence

Source. STRATILA Roxana, RONDIN Grégory, ITU Irina, TRANDAFIR Robert, CoE. UiPath Academy, < document issued from training non-accessible to the public >

Phase 6: Offer post-project support

Each problem is handled according to its priority level thanks to 3 levels of support:

- First level of support (customer): Responds to initial notifications of an incident.
- Second level of support (EY): Attempts to correct the failure and/or determine the source of the failure that could not be resolved by the first level of support.
- Third level of support (RPA Provider): Resolves issues that could not be resolved by the second level of support.

4.4.2. RPA Implementation Obstacles and Best Practices

When implementing robotic automation solutions, every business faces challenges to overcome.

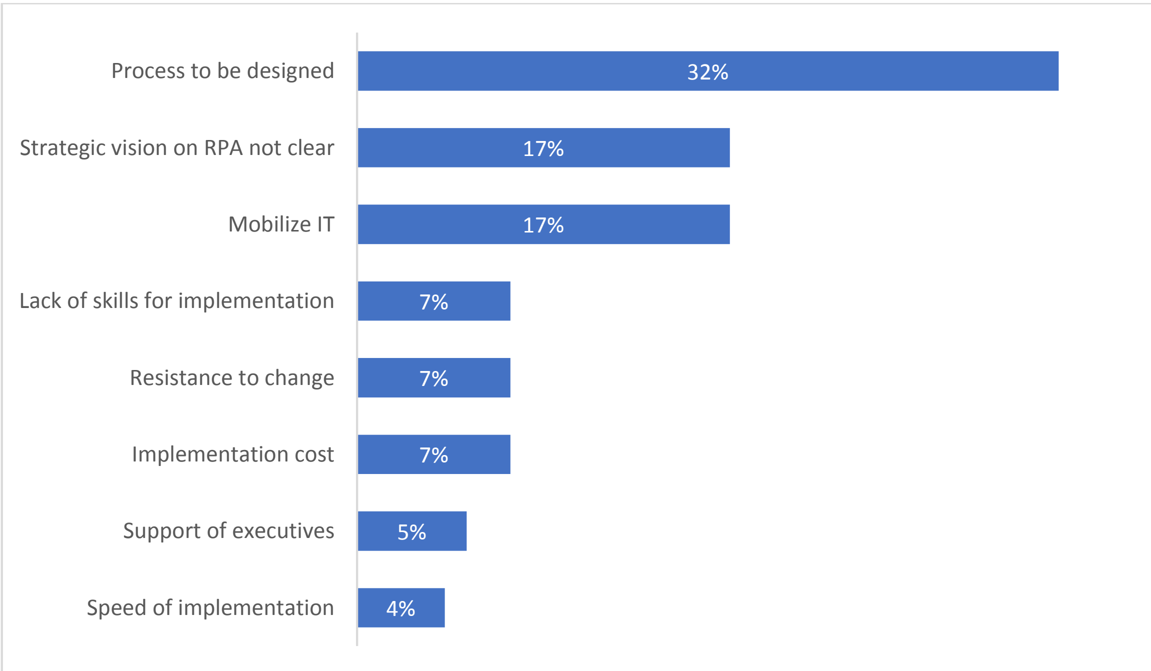
Obstacles of RPA projects:

Resistance to change is defined as the number 1 challenge in RPA solution implementation projects. Indeed, some of these projects can be traumatic for employees, because they involve additional responsibilities and the acquisition of new skills. (Leslie Willcocks, 2015)

Beyond the choice of activities to automate and the need to design end-to-end processes, the lack of a clear strategic vision and the difficulties in mobilizing IT are the biggest obstacles to the massive deployment of RPA. Generally caused by the variety of cases to be processed, the disparity of activities and the diversity of applications used, the fragmentation of processes generates a multitude of small tasks to automate whose unit profitability remains to be demonstrated.

The following figure highlights the main obstacles generally encountered when implementing an RPA solution.

Figure 9. Obstacles of RPA deployment



Source. DELOITTE STUDY, RPA: widely experienced, cautiously deployed. (2018) available on https://www.informatiquenews.fr/deloitte-2018-la-rpa-largement-experimentee-prudemment-deployee-58964

Furthermore, according to Deloitte's survey on the deployment of RPA, a large number of companies quickly launched into robotization without systematically taking the time to establish a clear vision, set an ambition and define the deployment route aligned with their strategic objectives. (DELOITTE, 2018)

In general, the IT department takes stock of the internal implications of RPA, that is to say on the way it is designed, developed and kept as close as possible to the business. As it increases its skills and adapts to RPA, deployments are more and more frequent. One thing is certain for the authors of the study, the IT department must be involved from the start of the deployment and must have a key role to play in the transformation. (DELOITTE, 2018)

Best practices and key success factors for the implementation of RPA :

The accumulation of experience on previous RPA projects has enabled the emergence of good practices and key success factors presented below: (WILLCOCKS, LACITY, & CRAIG, 2015)

- Prioritization of processes: Develop and use frameworks for evaluating and prioritizing processes, and ensure the involvement of process owners as early as possible for validation of the business case.
- Design and Execution: Quickly move to a Poc or a Pov (Proof of Value) or even a pilot and adopt agile methods to pilot quickly.
- Responsibility of the Business Analyst and IT: Clearly define the roles of the Business Analyst and IT during process prioritization, deployment planning and execution.
- Stakeholder engagement: Communicate the value and potential of RPA at all levels.
- Benefits: Provide clear and regular updates on the types of benefits that have been derived from robotization and the progress made in each sector of activity.

Conclusion of the First Chapter

We presented, in the first chapter, the theoretical overview of our study which consisted first of a review of the rich literature on the different facades shaping our research, from business processes with their dynamics and factors, to banking processes, the banking sector in the digital era where we discussed the integration of digitalization in economic and financial activities, then highlighted the evaluation of state and growth of the digital bank, and finally, we exposed the concepts of Robotic Process Automation in banks without forgetting the risks, benefits and complexities of such innovation.

We then moved on to the conceptual framework where we discussed key elements crucial for our study, by diving into a vast world of different concepts, starting with the basics on business processes with their hierarchy, typology, influence and implications. To then go into digitalization and specialize in its adoption and world-shifting impact on the banking sector. Finally, we arrived to the essence of our research, the revolution of Robotic Process Automation, explaining in detail the different phases and thrilling steps of implementing such an innovation on business processes.

With the very interesting works previously done on this robotic automation, adding to that the help and documents acquired from the Ernst and Young Algerian office and its previous enlighting experiences with RPA, we managed to reach a satisfying point of sufficient information to confidently go into the practical side of our research in the next chapter.

CHAPTER II : Data and Methods

The second chapter introduces the organizational context of the host bank, CPA, and especially the host structure, the Monetics Management department, taken from data and documentation from the organization itself. The chapter also includes a methodological framework explaining the methodology, epistemological approach, and procedures followed.

Section 1 : Organizational Framework

This section aims to scrutinize the host bank and structure, defining all the key elements of the famous organization.

1.1. CPA Presentation

Crédit Populaire d'Algérie (CPA) is a universal public bank created in 1966 by Ordinance No. 66-366 on December 29th, with a share capital of 15 million Algerian Dinars. CPA was one of the first public banks to be created after the independence.

1.1.1. History of CPA

First and foremost, CPA took over the activities of the following five foreign banks: the Commercial and Industrial Popular Bank of Algiers (BPCI Algiers), the Commercial and Industrial Popular Bank of Oran (BPCI Oran), the Commercial and Industrial Popular Bank of Constantine (BPCI Constantine), the Commercial and Industrial Popular Bank of Annaba (BPCI Annaba), the People's Credit Bank of Algeria (BPCA). In 1985, CPA sold 40 of these agencies as well as the transfer of 550 of its employees and managers and 89,000 customer accounts in order to give birth to the Local Development Bank (BDL).

The year 1989 was marked by the change in the legal form of CPA which became a "Public Economic Enterprise", legally structured as a joint stock company following the promulgation of the Law on Business Autonomy.

On April 7th, 1997, the CPA was approved by the Currency and Credit Council, complying with "law 90-10 April 1990"

In 2005, the CPA followed an outsourcing strategy which included the transfer of some activities (guarding, security and cash transport), to the responsibility of the company AMNAL (state-owned service and equipment company).

For 58 years, the CPA has relied on the diversification of its banking offering across all segments: individual, business, and professional. Today, the CPA is one of the main commercial banks in Algeria, its share capital is the exclusive property of the State, it currently amounts to

200 Billion Dinars whose strategy followed is based mainly on expertise and proven know-how to respond and satisfy the needs of its customers, while remaining close to them. For this it has strengthened its proximity via the launch of online banking services: Mobile CPA, e-banking, e-cp@, and two call centers including one dedicated to electronic payment services which ensures the continuity of service. (CPA Official Site)

1.1.2. Relevant Numbers

Currently, the CPA has a strong geographical network with 161 agencies spread across the entire Algerian territory headed by 15 operating groups, several agencies are equipped with cash dispensers or automatic teller machines (ATMs), which allow the account holder to withdraw cash or consult his account using a CIB card (interbank card). In total, the bank has 206 ATMs in operation and 7 waiting to be put into service, and more than 3,800,000 cards, for the latter the commissions for each withdrawal amounts to 10 DA, in case the withdrawal is made by the customer from the ATM of one of the agencies of the bank. Otherwise, if the ATM belongs to another bank, or an Algerian Post Office, the commission will amount to 15 DA per withdrawal.

In addition, the bank has 96 Islamic finance windows in order to open new horizons for investors on the one hand, and to contribute to the banking of economic agents, customers and businesses alike, on the other hand.

To achieve its objectives, the bank currently has more than 4,451 employees.

With its IPO (Initial Public Offering) in 2024, the CPA is offering 22 million shares for sale, a number increasable to 60 million while remaining within the limits of 30% of the share capital.

The following table presents the evolution of CPA's capital in Million Dinars since its creation:

Table 4. Evolution of CPA's Capital

Year	1966	1992	1996	2000	2004	2010	2024
Capital	15	5600	9310	21600	25300	48000	200000

Source. Made by researcher, based on the annual reports of CPA

1.1.3. CPA Missions

Banks are characterized by a fairly complex and high-risk activity, which is why the banking sector is one of the most regulated sectors. (SANTOS, 2001)

In the economy, banking plays a fundamental role. On the one hand, it plays the role of financial intermediation according to the theory of financial intermediation, which considers the bank as an institution that collects deposits to simply grant credits. On the other hand, it creates money, that is to say monetary creation is carried out by granting credit according to the theory of the endogeneity of money. (EL HOURANI, 2022)

CPA has a very important role in the Algerian economy in general, and is authorized to promote the activity and development of many sectors such as building, public works and hydraulics, the hospitality industry, tourism, the industrial sector, agri-production, business and marketing, crafts, and distribution. (CPA Official Site)

1.1.4. CPA Achievements

CPA has contributed to the financing of numerous projects, including the “Bab Ezzouar” Shopping and Leisure Center, Es-Senia Mall in Oran, “Carrefour” in Algiers and the Park Malls of Setif and Oran.

A very large number of tourism projects including the hotel chains Ibis and Novotel, Hyatt regency airport hotel, Golden Tulip, Hilton and Aurassi hotels in Algiers, Eco-tourism in Annaba, SHIFABE hotel in Bejaia, tourist complexes belonging to the hotel group EGT (Tipaza, Sidi Fredj, Zeralda, Algiers center and Biskra) and the Sahel residency.

Other large-scale industrial projects such as:

- Seawater desalination: Miyah Bahr Honaine, Miyah Tipaza and Tenes Lilmiah;

- The International Conference Center known as CIC in Algiers;

- Pharmaceutical production companies: Pharmalliance, Abdi Ibrahim remedy pharma, Santen lab group;

- Steel complex: Lamoa, Megasteel, Maghreb Inox;

- Various agri-food production companies;

- ANSEJ: more than 72,560 files with a total of 61,294 million Algerian Dinars;

- CNAC: more than 30,409 files with a total of 66,163 million Algerian Dinars;

- ANGEM: more than 21,820 files;

- Assisted housing: 199 AADL projects and 30 ENPI projects.

1.2. Presentation of the Host Structure: Monetics Management

The popularization of the use of electronic banking in most developed countries is the starting point for theoretical and empirical research in the field of the economics of means of payment for several reasons. Traditional payment methods such as cash and checks are expensive to process. It is therefore a matter of economic efficiency for banks and financial authorities to accelerate the shift from paper to electronic means of payment in order to reduce the social costs of payment systems. (AL MAJALI & BASHABSHEH, 2016)

Monetics Management or MM is one of the main axes and a key division within the bank given the evolution of technology and security requirements, which has strongly impacted means of payment and more generally electronic banking.

This electronic payment department is responsible for the management and control of electronic payment operations, as well as the supervision of electronic payment instruments and channels.

1.2.1. Missions of the MM Department

The MM department's main responsibilities are to:

- Ensure relationships with payment systems (domestic and international) and use technical documentation,
- Manage the information and data transmitted by the operating network to personalize bank cards and configure electronic payment terminals,
- Produce bank cards ordered by the operating network,
- Install electronic payment terminals at merchants affiliated by the operating network as well as the automated teller machines (ATMs) and ensure their proper management (technical monitoring of their operation),
- Use the files of transactions carried out by cards, electronic payment terminals and automated teller machines,
- -Process and issue the necessary accounting entries to the domiciliary offices,
- Develop periodic and regulatory statistical declarations for payment systems (domestic and international),

- Provide logistical support to the operating network and the network of affiliated merchants.
- Design and develop new electronic payment products and services,
- Participate and contribute to the digital transformation of the bank,
- Contribute to the fight against fraud and the improvement of risk management systems.
- Develop and/or update procedures and regulations related to the electronic banking sector,
- Establish a regulatory and technological monitoring system in relation to the requirements and innovations decreed by the national and international environment in terms of the development of electronic banking.

1.2.2. Structure of the MM Department

The MM department of CPA is organized into four distinct functions:

National electronic banking:

This function mainly consists of:

- Handling all requests from the operating network regarding the production of cards, installation of EPTs and implementation of the online payment services (e-payment);
- Ensuring the monitoring and control of all domestic electronic payment transactions;
- Assisting and guiding the operating network in this area;
- Handling customer complaints relating to this area.

International electronic banking:

This second function is composed of:

- Handling all requests from the operating network regarding production of international VISA and Mastercard and the installation of EPTs accepting said cards and any other related services;
- Ensuring the monitoring and control of all international electronic payment transactions, and the proper functioning of processes linked to the use of international cards;
- Assisting and guiding customers as well as the operating network in this area;
- Handling customer complaints relating to this area;
- Providing specific assistance to the bank's major customers.

Studies, analysis and development:

This function mainly aims to:

- Ensure the relationship between the bank and the different payment systems (national and international);
- Guarantee compliance with both internal and external regulations regarding processing electronic payment transactions;
- Collect, use and disseminate regulations in relation to the requirements decreed by the national and international environment, and monitor their application;
- Take charge of the examination and processing of supplier contracts with different internal organs;
- Set up a regulatory, normative and technological monitoring system in matters of electronic banking development;
- Offer new electronic payment products and services and new payment offers of payment, depending on technical developments;
- Ensure the establishment of a system for managing risks and combating fraud;
- Regularly analyze all areas of electronic payment activity;
- Periodically develop statistical reports and management indicators;
- Provide the bank's structures, particularly sales, marketing and control management, activity analysis reports.

Accounting and contract management:

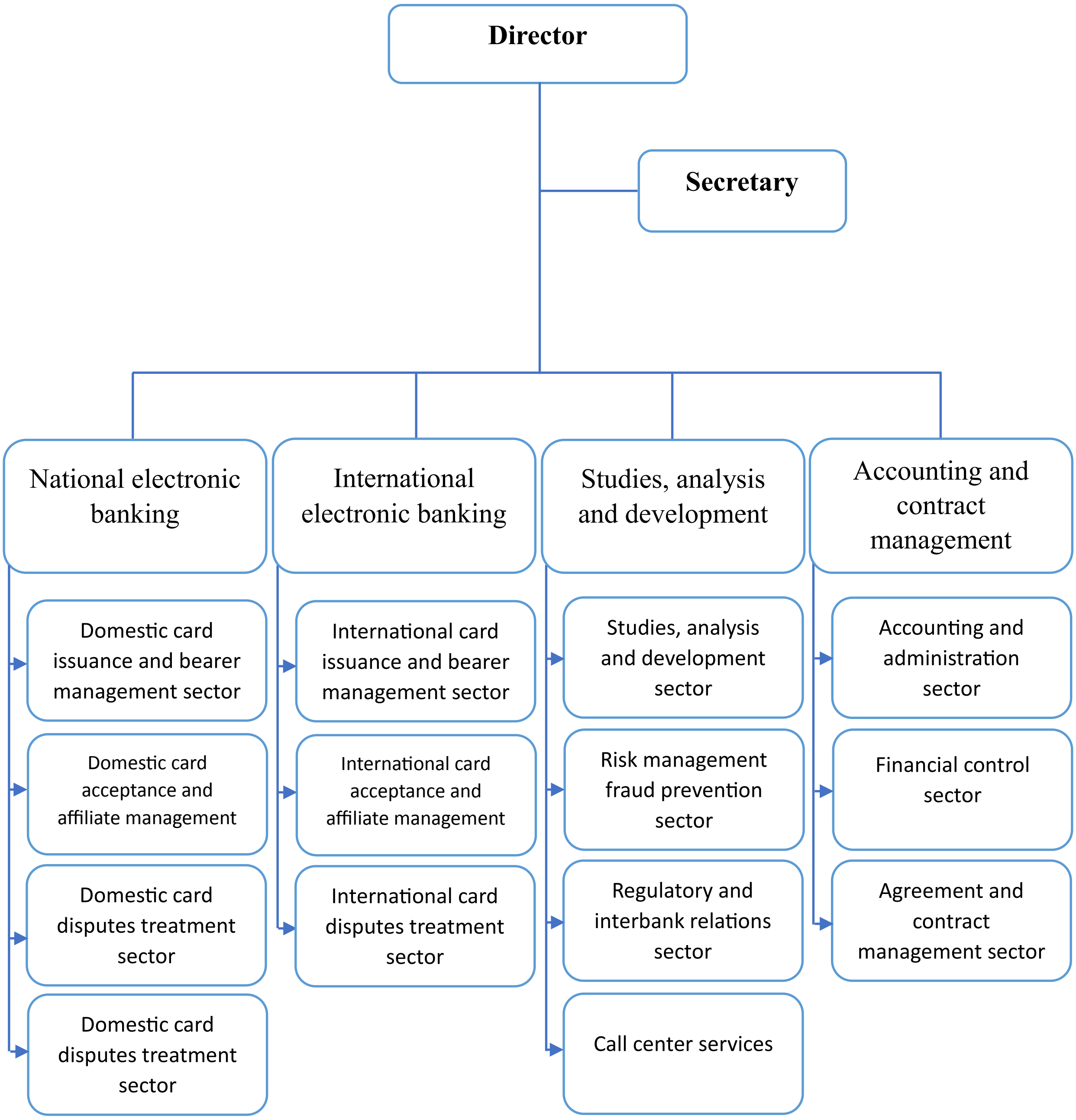
The last function involves:

- Ensuring the accounting treatment of electronic payment transactions, by carrying out the assembly and the control of currency and dinar accounting days;
- Journalizing, in the appropriate accounts in dinars and foreign currencies, the operations of electronic banking, and managing the structure’s documentary base;
- Ensuring the processing of invoices from various local and foreign service providers;
- Centralizing transfer and repatriation operations with the Directorate of External Operations;
- Ensuring consistency of coverage and recovery of electronic payment transactions by relation to remittances from payment systems (domestic and international);
- Monitoring reconciliation accounts opened abroad;
- Ensuring control and monitoring of internal accounts managed by the services of the Directorate of Electronic Payments;

- Guaranteeing the monitoring of contracts signed with the various service providers;
- Preparing and execute the budget of the structure once notified and establish the report of its execution;
- Managing the human and material resources necessary for the operation of the structure;

The following figure explains the organization of the Monetics Management department:

Figure 10. Organizational chart of the MM department



Source. Internal CPA document

1.3. Electronic Payment Methods of CPA

The term “monetics” comes from the fusion of the two terms: money + electronic, it designates the transport and transmission of transactions carried out by the card holder.

According to (BRUN, 1999), in the strict sense, electronic payment refers only to payment that does not require direct contact between natural persons. In a broad sense, it corresponds to any payment of a sum of money involving the use of electronic mechanisms.

As to (WERY, 2003), he says that "electronic payment includes a set of payment methods initialized with a system that uses electronics: card payments and payments that are made on the Internet and payments that are made on mobile"

More recently, (IBEGHOUCHENE & MOKRANE, 2022) described electronic payment simply as “a means of payment that allows the consumer to pay for goods and services electronically, using a smartphone, the Internet, a point of sale or a merchant website.”

Therefore, we can present electronic payment as the implementation of technologies to allow the use of bank cards and the transactions associated with the latter (online payment, withdrawal operations on ATM or payment via EPT).

In the strict sense, electronic payment refers to payment which does not require direct physical contact between persons; in the broad sense, it corresponds to any payment of a sum of money involving the use of electronic mechanisms.

CPA plays a leading role in the development and promotion of electronic payments in Algeria. As a large national bank, the CPA has positioned itself as a major player in this constantly evolving field.

1.3.1. CPA Credit Cards

A bank card is a means of payment issued by a credit institution, a payment institution or an electronic money institution, allowing payment and/or withdrawal transactions to be carried out. Related services may also be associated with it (insurance, assistance, etc.).

CPA was one of the first Algerian banks to introduce credit card payments and has thus made it possible to facilitate electronic transactions for its individual and professional customers.

Credit cards are rectangular pieces of plastic in a format standardized by the ISO (International Standardization Organization) system. The general term “card format” designates a dedicated card with the dimensions defined by the ISO 7810 standard (85.6 mm wide, 53.98 mm high and 0.76 mm thick). (SATIM)

Figure 11. Mentions to be found on the credit card

1. Identification of the institution issuing and owner of the card
2. Interbank logo
3. Expiry date
4. Name and surname of the customer
5, The chip, a key element of system security
6. Card number
7. Signature panel
8. Address of the issuing institution
9. Visual cryptogram, last 3 digits on the card signature panel, it is an additional element of securing remote payment
10. Magnetic stripe

Source. Bitakati.dz

The process of obtaining a credit card from CPA takes place in several stages. First, the customer must open a bank account and submit a card application. Once the request is approved and the card file is created, the file is then sent to SATIM, the company for Automation of Interbank Transactions and Electronic Payments. SATIM then makes the physical card with the proper identification and necessary security codes, calculating the confidential codes such as the 4-digit code, the CVV2 visual cryptogram and the OTP (One Time Password) code.

The client can then activate their card directly at a CPA agency, receiving the codes necessary to use the card safely. The process usually takes 10 to 21 days, from the day of creating the account, to the day of receiving the physical card and activating in. CPA also offers card management features, such as the ability to recalculate codes if forgotten or to file an opposition in the event of loss or theft of the card. This comprehensive process ensures customers have a secure and convenient experience when using their CPA credit card.

The services offered vary depending on the type of card chosen – the classic or gold for individuals, and corporate or corporate plus cards for companies and businesses - each having different withdrawal and payment limits.

Figure 12. Credit cards offered by CPA

Classic CPA Interbank card

Gold CPA Interbank card

Corpor@te CPA Interbank card

Corpor@te Plus CPA Interbank card

Source. cpa-bank.dz

1.3.2. Automated Teller Machines

An Automated Teller Machine, commonly known as an ATM, is a computer powered by banknotes, which allows the card holder to withdraw a sum of money available in their account without having to go through the counter of his bank.

These ATMs are secure and connected to the bank's information center; each operation is recorded and must be validated by the latter within a short time. The card holder has a security code (called PIN code) made up of 4 digits, which he must enter to gain access to the attached account.

To facilitate access to cash for its customers, CPA has an extensive network of 213 automatic teller machines. This fleet is made up of different types of dispensers supplied by the manufacturers NCR, Diebold and Hyosung.

Each ATM is made up of an upper part accessible to customers, including the screen, the card reader and the banknote distribution device. The lower part houses the banknote storage compartments, computer systems and operating mechanisms.

In order to ensure effective management of this vast fleet of ATMs, CPA has implemented a centralized supervision application. This makes it possible to monitor the status of each distributor in real time, receive reports of possible breakdowns or malfunctions from its agencies, and trigger the necessary maintenance interventions.

This extensive ATM network guarantees CPA customers convenient and reliable access to cash withdrawals throughout the national territory.

Before carrying out a withdrawal transaction, the customer must ensure that his account is funded; the balance must be sufficient and available, otherwise the withdrawal transaction is refused.

A withdrawal transaction from an ATM goes through several stages:

- inserting the bank card;
- composition of the PIN code for bearer authentication;
- the choice of the operation wishing to carry out (withdrawal);
- selection of the desired withdrawal amount;
- the request for authorization from the bearer’s bank;
- rejection of the bank card;
- the distribution of tickets as well as a transaction ticket (the distribution of the ticket is optional, at the choice of the wearer).

1.3.3. Electronic Payment Terminal

The CPA offers its merchant customers a vast network of 10,700 electronic payment terminals (EPT) across the country, both physical and virtual. These EPTs allow clients to easily accept bank card payments for their businesses.

Physical EPTs include models such as the Castel Vega 3000, Spire SPG7, Spire SPW70, and Enie ZT8225. They offer features like selling, canceling and refunding transactions, with a fee of 0.25%.

CPA is the only bank in Algeria to offer international electronic payment terminals, accepting Visa and Mastercard. For this service, CPA uses exclusively the Ingenico Move 2500 model, both wired and wireless.

This international EPT requires the opening of an account in dinars with CPA, the signing of a contract and the sending of a creation event by the agency with a merchant identification number.

More than 600 Algerian establishments in various sectors already benefit from these international Ingenico Move 2500s, mostly hotels, but also car rental companies, duty-free outlets, insurance companies, restaurants and pharmacies.

1.3.4. Mobile Apps

In March 2021, the CPA launched a mobile banking application, as part of its digitalization approach. The “Mobile CPA” service (via the internet) allows customers from their mobile phone to:

- Consult the balance of their accounts (dinars, currency, savings) and the history of their transactions;
- Make domestic transfers (less than one (01) million dinars) remotely in complete security for the benefit of one or more beneficiaries without traveling to their domiciliation agency (those domiciled at the CPA and also those domiciled with colleagues);
- Order their checkbook remotely;
- Receive their bank identity statement by SMS or e-mail;
- Contact their agency by email or telephone securely.

CPA is also working on introducing a major new app called M-Pay in collaboration with a start-up company, and though it is still under wraps and confidential that we do not have the authority to talk about its details, we can say with certainty that it is an innovative one of a kind application that will put CPA at the front of the Algerian E-Banking market.

Figure 13. CPA Logo

القرض الشعبي الجزائري

CREDIT POPULAIRE D'ALGERIE

Source. cpa-bank.dz

Section 2 : Methodological Framework

It is essential for us to emphasize that the main objective of this study is to develop an explanatory framework of the feasibility of implementing an RPA solution on the business processes of a bank.

All scientific research is based on a vision of the world, follows a methodology and offers elements of response (Gavard-Perret, Gotteland, Haon, & al, 2018). This section therefore discusses the methodology adopted and explains the methodological approach followed as part of this research.

2.1. Epistemological Approach

The use of a research method is often the consequence of a methodological and epistemological choice. According to (COHEN, 1996), epistemology is "a simple critical return of the knowledge about itself, its purpose, its conditions of formation and legitimacy; it is defined as the philosophy of knowledge, the theory of science, or the Theory of Knowledge".

According to (CHABANI & OUACHERINE, 2013), "Epistemology refers to critical study principles, hypotheses, and results of various sciences, intended to determine their logical origins, their values and their objective scope".

The determination of the epistemological posture is the first phase of a research as all research includes an epistemological paradigm, the latter consists of two main types of paradigms.

2.1.1. The Paradigms

The pragmatic philosophy believes that an objective reality exists independent of human experience, but we can only access and understand it through our experiences and interactions with the environment. Pragmatism rejects the idea that there is one permanent, unchanging truth about reality. Instead, our knowledge and perception of reality is shaped by socially constructed habits, beliefs and practices. Pragmatic researchers favor whichever interpretation or understanding of reality is most useful and effective for achieving desired outcomes. A core premise is that all knowledge ultimately derives from human experience. However, pragmatism views knowledge not as a mirror reflecting an external reality, but as a practical tool to help us navigate the world and live more effectively. The ultimate measure of knowledge is how well it allows us to cope with the world around us. (KAUSHIK & WALSH, 2019)

Each research work requires an epistemological paradigm. This choice includes several epistemological paradigms, most well-known of which are:

Positivism: its founder is Auguste Comte who said: "that the word positive designates the real", (Le Moigne, 1995). The positivist adopts deductive reasoning, which means that true knowledge cannot be based on the senses. Certainty comes from deduction (from our reason, from our reasoning). From intuitions (or premises), it is a question of deducing other statements that are the consequences. The main stand-points of positivism according to (CROOM, 1999) are:

- Reality exists as truth;
- Knowledge is an open context;
- Research can reveal the "true" state of affairs;
- The basic posture is reductionist and deterministic;
- Verification: How is validity ensured?

Constructivism: (LARGEAULT, 1993) said that: "an object exists if one is able to construct it, to exhibit an example of it or to calculate it explicitly". The constructivist has an inductive reasoning, induction consists of inducing general statements and truths from particular, rigorous, and systematic experiments. Constructivism relies on the following stand-points: (CROOM, 1999)

- Reality is dependant through the individual (existential);
- The purpose of research is to look at the world through the point of view of the subject;
- To understand, one must interpret;
- The constructivist is concerned with how to know and how to do.

2.1.2. Choice of Paradigm

In this feasibility study exploring the implementation of an RPA solution within the business processes of the banking sector and specifically CPA, we adopt a constructivist epistemological position. The constructivist paradigm aligns with our approach as we aim to develop an understanding through actively engaging with the practical realities and contexts involved. By immersing ourselves in the specific situations and processes within the CPA bank, we can construct knowledge from observations and reflections on the ground. This paradigm allows us to iteratively build insights into how RPA can augment or streamline existing workflows based on the complexities uncovered through hands-on investigation. As we construct this applied understanding in action, new perspectives will emerge to shape recommendations for feasible RPA implementation tailored to the unique needs of the banking sector's business processes.

2.2. Research Design

Research approaches are research plans and procedures that cover steps from general hypotheses to detailed methods of data collection, analysis and interpretation. According to (CRESWELL & CRESWELL, 2018), research approaches can be qualitative, quantitative, or mixed.

2.2.1. Qualitative Approach

A qualitative approach aims to understand or explain a phenomenon in a descriptive method that focuses on interpretations, experiences and their meaning, with the main objective of helping researchers to develop a deeper comprehension of the topic put under the microscope from a humanistic and somewhat philosophical point. This type of study is based on the collection of data obtained using two main methods; observations and interviews. The data, which is not statistically measurable, must be interpreted subjectively. The results of a qualitative study focus on interpretations and their meaning.

2.2.2. Quantitative Approach

A quantitative approach is used to prove or demonstrate facts by quantifying a phenomenon, and gathering and analyzing numerical data extended to a vast population using mathematical techniques in order to comprehend events. The measurement of variables is the foundation of a quantitative research. This method can be carried out using a survey or a questionnaire, and the results are expressed in numerical data (statistics) that make it possible to calculate averages, count the frequency of a certain response, divide the data into percentages, etc. Most often, the results of a quantitative study come in the form of statistical tables or graphs. This methodology is often used in scientific studies for its unbiased and attentive technique.

2.3. Choice of Methodology

We have found that a qualitative approach would be the more suitable methodology for our thesis, as we aim to study the feasibility of implementing an RPA solution on a few business processes related to the monetics side of banks. The qualitative approach can help us achieve a comprehensive understanding of complex phenomena in real time by using qualitative methods, such as interviews, meetings, document analysis, process mapping and observation. Therefore, in order to address the research topic head-on and achieve the set goals for our study, we have decided to follow the qualitative approach.

By relying on qualitative techniques, we seek to map observations of the current "As-Is" business processes, conduct structured interviews with the employees responsible or involved in executing these processes, and analyze the "To-Be" business processes with the help of relevant and proper documentation and experiences provided by the EY office. We also aim to study the proof of concept for this project, by conducting semi-structured interviews. Using this methodology allows us to gather rich and detailed data and gain a deep understanding of the evaluated business processes, in order to have a broad view and a solid foundation for a comparative analysis of the potential implementation and impacts followed.

Some quantitative elements can be incorporated, such as cycle times and error rates, for a more detailed assessment of the feasibility of implementation. However, our primary focus is on the qualitative aspects given the small number of processes analyzed and reduced number of people interviewed.

2.4. Data Collection Methods

It is crucial to explain the use and importance of the instrumental methods used during our study in order to have a clear understanding of the data acquired and analysis done.

2.4.1. Observation

In our case, observation during the internship took form in closely watching and noticing the step-by-step activities making the business processes executed by the employees of CPA's MM department. This allowed us to gather the necessary information like time cycles, decision points and resources needed, in order to form a well-rounded assessment and map of the processes and choose the ones to be analyzed and used in our study.

2.4.2. Document Analysis

Throughout the course of our study, we took advantage of a variety of sources. The main ones used are websites like Google Scholar, ASJP, theses-algerie, Z-Library and ScienceDirect, which gave us access to rich collections of books, articles and other works that enlightened our research. We also found great use in the libraries of the Kolea university pole, especially the ENSM library. In addition, the EY documentation and material of which we were able to gain access, is what truly guided us and is the driving motor to the execution of our study. We had the privilege of having all the necessary EY documents, database and experiences that showed the way and every detail needed for our work.

2.4.3. Interviews

A series of structured and semi-structured interviews was conducted with executives and employees responsible or involved in the execution of business processes studied, in order to gather thorough and accurate data and insight. The process of choosing the right interview subjects was not that difficult as we didn't want to have a pre-judgement going into the interviews; the executives were obvious and the employees/processes were not given a lot of thought as we wanted the experience and information found to be as accurate and viable as possible for a realistic interpretation. There were 2 parts to the interviews with employees, a first well-structured part where the questions were all pre-set regarding the actual processes and step-by-step activities, in order to get all the necessary information for the most accurate analysis. These questions were inspired by research done and documentation analysis, and also guidance from the EY office. The second part of the interviews was semi-structured as we took a more humanitarian point of view, looking at different variables like expectations, concerns and reservations. We made sure to record and take note of every detail of the interviews, with the consent of the subjects, as to not forget or lose any important or relevant information.

The following table presents the names of the interviewees, their functions, their email addresses, and the duration of each interview:

Table 5. List of interviewees

Name	Function	E-mail	Duration of interview
Mr. Redouane SNOUCI	Director	Redouane.snouci@cpa-bank.dz	73 minutes
Ms. Sara KASSALI	Head of MM department	sara.kassali@cpa-bank.dz	73 minutes
Mr. MADDI Brahim	Head of accounting and contract management department	brahim.maddi@cpa-bank.dz	35 minutes
Mr. Walid KALI	Sector Officer	w.kali@cpa-dmmp-dz.com	43 minutes
Ms. Assia SAIDI	Research Officer	Reporting.nat@cpa-dmmp-dz.com	43 minutes
Mr. Chakib OUABADI	Sector Officer	c.ouabadi@cpa-dmmp-dz.com	18 minutes
Ms. Laila BELAID	Sector Officer	l.belaid@cpa-dmmp-dz.com	68 minutes
Ms. Siham HARFOUCHE	Research Officer	Chargeback.nat@cpa-dmmp-dz.com	68 minutes
Mr. Nabil IGUEMLAIEN	Research Officer	n.iguemlaien@cpa-dmmp-dz.com	53 minutes

Source. made by researcher

2.5. Data Treatment

Qualitative data analysis often involves a cyclical process of data collection, processing, and interpretation. Coding, memoing, and diagramming are some common methods utilized in this process. In general, qualitative data analysis is a powerful tool for understanding human experiences and perspectives, as well as complex phenomena. (CRESWELL & POTH, 2018)

NVivo, the computer-assisted qualitative data analysis software (CAQDAS) allows researchers to manage, organize, and analyze qualitative data, including text, audio, video, and images. It provides a variety of tools for data coding, categorization, analysis, visualization, and reporting. NVivo supports qualitative research methodologies such as grounded theory, thematic analysis, and discourse analysis, among others. It is widely used in academic research, social sciences, business, and other fields where the analysis of qualitative data is crucial. (JACKSON & BAZELEY, 2019)

2.5.1. Data Collation

Data collation is the process of compiling information from various sources, including interview notes, researcher reflections, secondary data, literature sources, participant-provided or obtained documents, and visual materials like photos, drawings, or diagrams. The data gathering process involves several steps, such as verifying the accuracy of the source data, removing personal or irrelevant information, omitting conversational dialogue that helped build relationships, reformatting the data to facilitate management and use, and providing context to emphasize key points and make comments more understandable.

2.5.2. Data Analysis

During the analysis phase, data must be organized, structured, and examined. Transcripts are an important source of information for this process. The analysis involves categorizing, coding, counting, and mapping the data, which divides qualitative data into separate sections and assigns a reference to each area. Categorization aids the coding process and helps generate data points that either confirm or refute theories or premises in the final findings. Coding enables researchers to locate important data and creates the framework for deriving conclusions and understanding meaning. Counting reveals interesting trends and connections within the data, contributing to more reliable results that address the research questions. Mapping the data helps in the transition to presenting the data sets, their relationships, and the analysis, improving the understanding of the problem and the outcomes of the process for both the researcher and the reader.

2.5.3. Data Presentation

Data Presentation consists of organizing and compressing data so that the reader and researcher can draw conclusions and be inspired to take further action is known as data presentation. The researcher can show how the various data points are interconnected by displaying information using matrices, graphs, charts, and networks. In this phase, the research question is addressed, valuable discoveries—both positive and negative—from the data interpretation are shared, the research's findings and outcomes are validated, the appropriate data display formats are chosen, and the data representatives are scrutinized before the presentation.

2.6. Challenges

The main challenge we faced in our journey was the lack of education of employees in the domain of computer science and automation, we found that a lot of employees do not even acquire the basic knowledge of computer science or technological advances, making some of them refuse even the idea of discussing the topic.

2.7. Significance of the Study for CPA

Conducting a thorough and well-designed feasibility study can provide CPA with valuable insights, data-driven suggestions, and a roadmap for successfully implementing RPA in its MM department.

An in-depth analysis of the current "As-Is" processes in the MM department can identify areas for improvement and inefficiencies, the data collected on metrics like cycle times, error rates, and resource utilization can demonstrate the potential productivity gains and cost savings that RPA implementation could bring. While proposing "To-Be" processes enhanced through RPA, we can help CPA streamline its operations, reduce manual efforts, and improve overall process efficiency.

The interviews play a leading role in gaining valuable insights into the pain points of employees, their concerns, and expectations regarding RPA implementation. Addressing these factors helps CPA develop a more effective change management strategy to ensure a smooth transition, leading to better engagement and acceptance.

Our work with EY and their support and guidance only reinforce our study in the eyes of CPA as the path for our research was set with the help of professionals in the domain of automation and robotics, which lets our study serve as a pilot or proof-of-concept in the potential implementation.

All these factors can help CPA make more informed decisions about investing in RPA and justify the business case for automation.

Conclusion of the Second Chapter

In short, this chapter gave a thorough and detailed view of the host organization, and more specifically the host structure, going into the history of CPA, its main missions, most successful and known achievements, and the organizational context of the MM department, diving deeper into its different facades, activities, and offers.

The data used in our study is a pile of different sources, from websites, to libraries, articles, books, dissertations and online data collection, to official documents from the EY office and data provided by the host bank.

The chapter also describes the approaches chosen and techniques and methods followed, from observing to collecting data to analyzing it and improving our comprehension. The qualitative methodology and constructivist paradigm are most suitable to use for studying the potential of implementing an RPA solution in digital banking business processes.

CHAPTER III : Results and Discussion

Section 1 : Comparative Study of the Processes: As Is/To Be

Process selection plays a crucial role in successfully implementing RPA in the bank. The right process needs to be selected, and must be prioritized. Otherwise, the implementation project risks failure. It is crucial to have a very accurate assessment of processes candidate for automation, and that is done by sitting side by side to process experts and watching the process being executed manually. This observation, along with interviews, provides the necessary information to assess the possibility of implementing RPA in each candidate process.

As mentioned earlier, the choice of processes to study is kept random in order to get an authentic to get an authentic and realistic experience, although the heads of the MM department were asked to guide the researcher to the most important processes done on the premises and they suggested a few.

The work is divided by process, studying the current processes "As Is", and checking the possibility of automation step by step. The method of process assessment followed is a method suggested by the EY office. After sending the work to the EY office and getting back the necessary data, the To-Be processes are studied and compared.

To study each current process "As Is", in-depth interviews were conducted with the employee(s) responsible for executing said process as part of the qualitative approach. The purpose is to perform a thorough assessment of the process to see all the necessary aspects of each performed activity.

1.1. Process I: Application Treatment

This is the process of treating the applications of businesses looking to adopt Electronic Payment Terminals from CPA.

1.1.1. Initial Evaluation of Process I

Following the previously explained requirements of a process to be considered for robotic automation, this process is tested herein to check if it fulfills these requirements. Table 06 below displays the interview conducted with Mr. Walid KALI, the sector officer and the person responsible for this particular process, in the presence of Ms. Assia SAIDI, the research officer of this process, starting with the basic questions following the guide of figure 1:

Table 6. Interview of Initial Evaluation of Process I

Question	Answer
1/Is this process manual and repetitive?	Yes, it is
2/ Is it rule based?	Yes, the treatment process is subjected to clear processing instructions, with decision points based on predictive and standardized rules.
3/Are the inputs electronically readable?	Yes, PDF files from our agencies are sent every day and the data is presented in a structured and legible manner, with regard to the Excel file which contains the name, first name, and E-Mail address.
4/ Are they standard?	Indeed, the files always contain the same information of clients, like the name of the business, the address, whether they want to order a physical or a virtual EPT, and all the basic information.
5/ What can you tell us regarding the complexity of this process?	the treatment process represents a rather stable process, standard and does not involve many execution steps.
6/Can this treatment method be changed?	For the time being and with the available equipment, no. Even with other equipment I don't see where it can be changed, really.
7/ What about the volumes treated?	Well, it depends on the season, really. The summer time brings more applications because of tourists, but it isn't a very big difference. I guess you could say we treat about 100 applications per week.
8/ Would a small automation improve this treatment process?	Not really. Given the simplicity of the process, a small automation would not make much of a change.
9/ Alright, do you see any profound system changes necessary?	Definitely not. No changes necessary.
10/ What is the current number of employees executing this process?	There are 2 people doing this work.
11/ How much time does the whole process take?	We take about 15 minutes per application.
12/Can it be done outside of work hours (8-16)?	Technically, yes. But we need to first receive the files from our agencies, and send the results back to the service providers once finished.
13/Can you take us through the process, step by step?	Of course.

Source. made by researcher

The following table presents the details of the process steps:

Table 7. Steps of Execution of Process I

Step	Duration
Recover data	2 min
Process and treat each application	8 min
Generate and inject profiles as a BM/TM file	3 min
Send to service provider	2 min

Source. made by researcher

The overall treatment process of a single application is 15 minutes and the level of process automation is 4/4 with no non-automatable minutes. Therefore, we can say that 100% of the process can be automated.

For the purpose of evaluating the exception rate of our process, the following factors were analyzed during the data collection phase in the initial analysis stage of the process. Each element is evaluated according to the following scale:

(1): Reduce the exception levels, the number of exceptions and the stabilization period of the robot.

(2): Average number of exceptions, robot stabilization period.

(3): Increase the number and levels of exceptions.

Explanation of the evaluation method:

Assigned a score of (1): if the factor presents a low risk of triggering an exception.

Awarded a score of (2): if the factor presents a medium risk of triggering an exception.

Awarded a score of (3): if the factor presents a high risk of triggering an exception.

Table 8. Evaluation of Exception Rate of Process I

Factor	Evaluation	Comment
Definition of the process	3	Non-availability of documents defining the steps of the process.
Field expert	1	Field experts (employees executing the process) have a good knowledge of the process and are available to assist with the implementation project.
Process Complexity	1	Simple process.
Application technology	1	Simple technology used.
Re-use of existing components	1	All the necessary components are existing and available.
Availability of materials	1	Computer equipment available.

Source. made by researcher

The evaluation of the exception rate of the application treatment process yields the following results:

- Definition of the process: this factor was evaluated with a score of 3, meaning that there is no documentation on the processes. This risks increasing the number and exception levels, but there is no gravity to this matter given the simplicity of the process. All that is needed to be done is to create the necessary document before setting the robot into action.
- Field expert: this factor was assessed with a score of 1, i.e. the field experts have good knowledge of the process and are willing to participate in the project. This results in an exception rate reduction.
- Complexity of the process: this factor was evaluated with a score of 1, i.e. this process is stable and does not face any updates. This factor does not generate exceptions.
- Application technology: this factor was evaluated with a score of 1, meaning that it does not generate exceptions due to the security system linkable to the robot.
- Reuse of existing components: this factor was evaluated with a score of 1, that is to say, the majority of the necessary components already exist and this results in an exception reduction.
- Availability of equipment: this factor was evaluated with a score of 1 given that the hardware infrastructure required is already available.

The system exception level (i.e. cases where unanticipated system events occur) is around 0% (no exceptions) when the process is made operational in production.

1.1.2. Second Evaluation of Process I (Assessment of Benefits and Complexity of the Process)

The following factors were analyzed during a second interview, just after validation of the process. Each element is evaluated according to its relevance.

For the benefit axis, the weighting is relative to the needs of the bank, while for the complexity axis, the weighting of these criteria is static and determined by the developers, because this directly influences development times.

The aggregation of the weightings (i.e. the sum of the criteria as a percentage) defines the overall rate of profits or complexity. The method of weighting of criteria was done by the EY office and was not revealed to us for confidentiality reasons.

The scale below allows interpretation of the results:

- 1: Low (between 0 and 30%)
- 2: Average (between 30 and 60%)
- 3: High (over 60%)

Benefits:

The evaluated factors of this process are presented in the following table:

Table 9. Evaluation of Profit Rate of Process I

Criteria	Evaluation	Weighting of criteria
Number of employees executing the process	2	10%
Average treatment time	15 min	25%
Average volume of applications	100	20%
Error rate	4%	10%
Frequency of the process	Weekly	20%

Source. made by researcher

As a result, the overall profit rate of the application treatment process amounts to 85%. (10%+25%+20%+10%+20%=85%). The benefits generated by this process are satisfactory (high).

Complexity:

We now move on to the complexity evaluation part, in order to determine the time necessary for its development, presented in the following table:

Table 10. Evaluation of Complexity of Process I

Criteria	Description	Evaluation	Criteria weighting
Dependence	Is there a dependence on other processes?	YES	10%
Constraints	Does the process face constraints (like a deadline, etc)	YES	5%
Free text	Does the process include reading free texts?	NO	00%
Image reading	Does the process include reading images?	NO	00%
Number of steps	Number of steps in the process?	4	2%
Automated parts	Are there any parts of the process that are already automated?	NO	00%
App tech	What is the application used?	Internal application of CPA	20%
Test environment	Is there a test environment available?	YES	00%
Exception	Exception Rate	00%	00%

Source. made by researcher

After aggregating all the criteria rates obtained, the overall complexity rate of the application treatment process amounts to 37% (10%+5%+2%+20%=37%). The EY office has decided that the robot development for this process requires about 4 weeks (sprints).

1.1.3. Process I Evaluation Conclusion

The classification of the process into automation quadrants is given in the table below:

Table 11. Automation Quadrants

Complexity	Benefit	Quadrant
Low	High	Rapid gain
Low	Medium	Rapid gain
Low	Low	Accessible Opportunities
Medium	High	Accessible opportunities
Medium	Medium	Rapid gain
Medium	Low	Long term improvement
High	High	Long term improvement
High	Medium	To improve
High	Low	To improve

Source. EY internal document

The process of handling EPT applications presents substantial potential gains coupled with moderate complexity, positioning it within the "Accessible Opportunities" quadrant. Automating this process can yield significant benefits if the right efforts and strategies are implemented effectively during the project execution. Based on the study and evaluation done, we can confidently say that the bank will see great results in automating this process using Robotic Process Automation, and the necessary data is available as it was collected during the interviews with the field experts in order to model the process.

The development of the RPA solution, for this process, is implemented in agile mode. The method recommended by the consulting firm EY in this context is the Scrum method because it is the most adapted to this type of project compared to other methods (see the state of the art), the programming of the process is done in 4 one-week sprints each. Each sprint will deal with one of the main functions defined by the EY firm, and tested separately from the others.

The following table represents the functions processed during each sprint:

Table 12. Sprints of Development of RPA Solution for Process I

Sprint	Function(s) treated
Sprint 1	Login Prepare for transaction
Sprint 2	Data extraction
Sprint 3	Data entry
Sprint 4	Intersection of data Closing of application

Source. made by researcher, from EY representative

After the finalization of the work relating to the infrastructure, the project to implement the RPA solution enters the final phase. In this stage of the project, the bank's employees executing automated processes must follow 2 training courses, which are as follows:

The first 30-hour technical training on UiPath, which will focus on the development of business processes and debugging of processes in the event that an anomaly is detected.

The second training will aim to ensure change management within the company level, to enable staff to work with software robots like natural persons.

1.1.4. Comparative Analysis of Process I

In order to put the results of the automation of this business process into perspective, a comparative study between the As-Is process and the To-Be process is conducted in this part. Table 13 shows the comparison between human capacity and robot capacity.

It is important to note that the working time per day is 7 hours (1 hour break).

Table 13. As-Is and To-Be Comparison of Process I

	As-Is Process (pre-robotic automation)	**To-Be Process (post-robotic automation)**
Number of executors	2 employees	1 bot
Execution time	15 min per application	Estimated 17 secs per application
Precision	Can make mistakes	100% precision
Number of application	Average of 100 per week	Average of 100 per week
Efficiency calculation	100 × 15 = 1500 minutes = 25 hours 25 hours / 2 employees =12,5	17 sec × 100 = 1700 sec = 28,33 minutes ~ half an hour

Source. made by researcher

The comparison shows that the treatment of 100 applications per week that is done by 2 employees in 12 and a half hours can be done by the bot in about 30 minutes, saving up huge amounts of time with zero error rate and freeing the human resources and brains to execute important tasks that need more intelligence than the activities of this mundane and repetitive process.

1.2. Process II: Configuration of International Electronic Payment Terminals

This process consists of configuring international electronic payment terminals according to demand from clients before sending them out to use.

1.2.1. Initial Evaluation of Process II

We executed an interview with Mr. Chakib OUABADI, the sector officer and the only person responsible for this process. Given the reduced volume of demands for these international EPTs, the interview is presented in the following table:

Table 14. Interview of Initial Evaluation of Process II

Question	Answer
1/Is this process manual and repetitive?	Basically, yes.
2/ Is it rule based?	I don't think there's only one answer to that question. Yes, there are steps to follow, but the customer's demands play a huge role and I do see the need to change those "rules" quite a few times.
3/Are the inputs electronically readable?	Yes, the agencies send PDF files that I go over, accept or deny the applications, then organize the data in another electronic file.
4/ Are they standard?	No, they are not, and that's because we receive different demands from different businesses looking to personalize their EPTs according to their needs and their customers.
5/ What can you tell us regarding the complexity of this process?	I guess you can say that it's average with two pluses. Haha. This is an intricate process requiring complete focus with no room for errors.
6/Can this treatment method be changed?	Absolutely not.
7/ What about the volumes treated?	I only configure a few EPTs per week, the number is sometimes as low as 3.
8/ Would a small automation improve this treatment process?	No, not at all. This process would need human intervention each step of the way.
9/ Alright, do you see any profound system changes necessary?	Definitely not. No changes necessary.

Source. made by researcher

1.2.2. Process II Evaluation Conclusion

Following the guide of Figure 1, we can conclude that this process is not up for automation, as it does not always strictly follow a set of rules, the data is not standard and can change in accordance with the client's needs, the process of configuration is rather complex, and human intelligence and intervention is very needed throughout the whole process, and finally, the volume of demands to configure is not elevated. All these factors lead to the conclusion that this process is not up for automation and its study must end at this initial step.

1.3. Process III: Treatment of Client Complaints

This process outlines the procedures for handling client complaints related to transactions conducted through Automated Teller Machines (ATMs) and Electronic Payment Terminals (EPTs). The process delineates the steps involved from the initial receipt of the complaint until its final resolution and archival. The treatment protocol is segmented into three distinct categories of complaints.

The first category encompasses complaints lodged by clients of CPA at a CPA agency when encountering difficulties with a CPA-operated ATM or EPT.

The second category pertains to complaints registered by clients of other banks at a CPA agency when experiencing issues while utilizing a CPA-managed ATM or EPT.

The third category involves complaints raised by CPA clients at agencies of other banks when facing challenges with the ATMs or EPTs operated by those banks.

While the treatment processes for these three categories of complaints are quite similar, there are a few distinguishing factors. For instance, complaints falling under the first category are handled and resolved internally, whereas the latter two categories necessitate the involvement of the Interbank Network SATIM due to the interbank nature of the issue.

For our research, we elected to investigate the treatment protocol for the second category of complaints, as it presents a higher degree of complexity and tends to be more protracted in its resolution.

1.3.1. Initial Evaluation of Process III

To gain comprehensive insights, we conducted an interview with Ms. Laila BELAID, the sector officer, who possesses extensive experience and profound knowledge in this field.

Table 15. Interview of Initial Evaluation of Process III

Question	Answer
1/Is this process manual and repetitive?	Yes.
2/ Is it rule based?	Yes, very.
3/Are the inputs electronically readable?	Of course, we receive the complaints electronically one by one once each client files it at an agency of ours.
4/ Are they standard?	Yes, always the same variables.
5/ What can you tell us regarding the complexity of this process?	Well, this category is the most complex of the three, but still it isn't that bad, it just takes the

	longest because it all starts at our agency, goes by SATIM, and then back to us.
6/Can this treatment method be changed?	No, it's already sort of delicate.
7/ What about the volumes treated?	On a normal day without network issues or anything? I guess 15 would be a good estimation. Keep in mind that that number represents complaints from all around the country.
8/ Would a small automation improve this treatment process?	I don't see how.
9/ Alright, do you see any profound system changes necessary?	Not at all. The system is adapted as well as possible to our work here.
10/ What is the current number of employees executing this process?	3 employees, each taking on a category of complaints.
11/ How much time does the whole process take?	Well, it's divided into 2 phases, issuing before SATIM and treating after SATIM. The first phase should take about 4 minutes while the second phase takes around 7 minutes.
12/Can it be done outside of work hours (8-16)?	Yes, but the agency would have to be working outside of those hours.
13/Can you take us through the process, step by step?	Sure.

Source. made by researcher

The following table presents the details of the process:

Table 16. Steps of Execution of Process III

Step	Duration
Complaint entry (card number, account number, date of transaction, date of complaint)	2min

Validate by picking right transaction from history of all transactions of the day	1min
Generate file	30sec
Send to SATIM	30sec
Receive RE file from SATIM	10sec
Treat file and divide by agency	8min
Entry of bank details, client details, and transaction details into second app	2min
Treatment	2min
Validation	30sec
Generate file	30sec
Archive complaint as "regularized state"	30sec
Generate RGP file	30sec

Source. made by researcher

The overall complaint treatment process takes around 18 minutes and the level of process automation is 12/12 steps with no non-automatable minutes. Therefore, we can say that 100% of the process can be automated.

Moving on to the evaluation of the exception rate, using the same method and scale used in the evaluation of the first process.

Table 17. Evaluation of Exception Rate of Process III

Factor	Evaluation	Comment
Definition of the process	2	Non-availability of documents defining the steps of the process.
Field expert	1	Excellent knowledge of the process and availability to assist with the implementation project.
Process Complexity	2	Too many steps.
Application technology	1	Simple technology used.
Re-use of existing components	1	All the necessary components are existing and available.
Availability of materials	1	Computer equipment available.

Source. made by researcher

The evaluation of the exception rate of the complaint treatment process showed the following results:

- Definition of the process: this factor was evaluated with a score of 2, for the lack of documentation on the process, which risks increasing the exception levels, but the excellent knowledge and long expertise of the field experts mustn't be forgotten. All that is needed to be done is to create the necessary documentation before setting the robot into action.
- Field expert: this factor was assessed with a score of 1, given their great knowledge and long expertise in the field of the process and their willingness to participate in the project. This results in an exception rate reduction.
- Complexity of the process: this factor was evaluated with a score of 2, i.e. this process is simple but long and has many steps that can elevate the risk of exception and faults.
- Application technology: this factor was evaluated with a score of 1, meaning that it does not generate exceptions due to the security system linkable to the robot.
- Reuse of existing components: this factor was evaluated with a score of 1, that is to say the necessary components already exist which leads to an exception reduction.
- Availability of equipment: this factor was evaluated with a score of 1 given that the hardware necessary is already available.

The system exception level (i.e. cases where unanticipated system events occur) is around 0% (no exceptions) when the process is made operational in production.

1.3.2. Second Evaluation of Process III (Assessment of Benefits and Complexity of the Process)

This evaluation is executed following the same method and using the same factors used in the second evaluation of process I. Here is a reminder of the scale:

- 1: Low (between 0 and 30%)
- 2: Average (between 30 and 60%)
- 3: High (over 60%)

Benefits:

The evaluated factors of this process are presented in the following table:

Table 18. Evaluation of Profit Rate of Process III

Criteria	Evaluation	Weighting of criteria
Number of employees executing the process	3	15%
Average treatment time	18 min	27%
Average volume of applications	50	10%
Error rate	10%	20%
Frequency of the process	Daily	20%

Source. made by researcher

As a result, the overall profit rate of the application treatment process amounts to 92%. (15%+27%+10%+20%+20%=92%). The benefits generated by this process are satisfactory (high).

Complexity:

Evaluating the complexity of the third process is detailed in the following table:

Table 19. Evaluation of Complexity of Process III

Criteria	Description	Evaluation	Criteria weighting
Dependance	Is there a dependance on other processes?	YES	10%
Constraints	Does the process face constraints (like a deadline, etc)	NO	00%
Free text	Does the process include reading free texts?	NO	00%
Image reading	Does the process include reading images?	NO	00%
Number of steps	Number of steps in the process?	12	8%
Automated parts	Are there any parts of the process that are already automated?	NO	00%
App tech	What is the application used?	Internal application of CPA	20%
Test environment	Is there a test environment available?	YES	00%
Exception	Exception Rate	5%	2,5%

Source. made by researcher

After aggregating all the criteria rates obtained, the overall complexity rate of the application treatment process amounts to 40,5% (10%+8%+20%+5%=40,5%). It appears that the complexity of the process is right under the middle line, requiring about 6 weeks of development.

1.3.3. Process III Evaluation Conclusion

Based on the Automation Quadrants presented in Table 11, this process with medium complexity (40,5%) and high benefits (92% profit rate) falls into the "Accessible Opportunities" quadrant.

Processes in the "Accessible Opportunities" quadrant are often considered low-hanging fruits or opportunities that can be leveraged to achieve efficiency gains, cost savings, or process improvements without requiring significant effort or resources. This quadrant suggests that the automation initiative for this process is relatively straightforward to implement while offering substantial benefits or profits.

The high profit rate (92%) and medium complexity (40,5%) of the complaint treatment process make it an attractive candidate for automation. Automating this process can potentially deliver significant benefits while requiring a moderate level of effort.

The development of the RPA solution, for this process, is implemented in agile mode. The method recommended by the consulting firm EY in this context is also the Scrum method. The programming of the process is done in 5 one-week sprints each.

The following table represents the functions processed during each sprint:

Table 20. Sprints of Development of RPA Solution for Process III

Sprint	Function(s) treated
Sprint 1	Login Prepare for entry
Sprint 2	Data extraction Communication line
Sprint 3	Data intersection and treatment Security measurement
Sprint 4	Second entry
Sprint 5	Data treatment
Sprint 6	Regularization Closing

Source. made by researcher

After the finalization of the work related to the infrastructure, the project to implement the RPA solution enters the final phase. It is planned and done the same way as previously seen with the first process.

Another side project would be to install a 24-hour complaint platform and link it with the bot, giving it the ability to work outside of work hours for maximum efficiency and benefits.

1.3.4. Comparative Analysis of Process III

Table 21 shows the As-Is and To-Be comparison between human capacity and robot capacity.

It is important to note that the working time per day is 7 hours (1 hour break).

Table 21. As-Is and To-Be Comparison of Process III

	As-Is Process (pre-robotic automation)	To-Be Process (post-robotic automation)
Number of executors	1 employee	1 bot
Execution time	18 min per application	Estimated 24 secs per application
Precision	Can make mistakes	100% precision
Number of application	Average of 15 per day	Average of 15 per day
Efficiency calculation	18 × 15 = 217 minutes = 4 and a half hours	23 × 15 = 345 sec ~ 6 minutes

Source. made by researcher

It is important to note that this study is done on only one of the three categories of complaints. We are only comparing one employee to one bot, but that one bot would be executing the treatment of all three categories of complaints replacing all 3 employees.

The comparison shows that the treatment of 15 complaints of this category per day takes 4 and a half hours, but can be done by the bot in a little under 6 minutes, saving up huge amounts of time with zero error rate and freeing the human resources and brains to execute important tasks that need more intelligence than the activities of this mundane and repetitive process.

1.4. Process IV: Supervision of ATMs

This process involves real-time monitoring of ATMs managed by the CPA across the country. It encompasses detecting and receiving issues related to these ATMs, and addressing and resolving these issues if possible. If the issue cannot be resolved with primary solutions, the appropriate party is then contacted immediately to resolve said issue, whether it be the agency, the ATM provider, or the bank's IT engineers, within targeted time frames. The primary objectives are to ensure optimal performance of the ATMs and maintain a high level of customer satisfaction.

1.4.1. Initial Evaluation of Process IV

To test the candidature of this process for automation, we conducted an interview with Mr. Nabil, the sector researcher, presented in Table 22:

Table 22. Interview of Initial Evaluation of Process IV

Question	Answer
1/Is this process manual and repetitive?	Yes, it is.
2/ Is it rule based?	Of course. We have codes for every single agency, ATM, and possible issue faced.
3/Are the inputs electronically readable?	Yes, we have the app to supervise in real time, and we receive electronic states from SATIM several times a day.
4/ Are they standard?	Yes, as I said, we gave codes for each variable.
5/ What can you tell us regarding the complexity of this process?	Not complex at all, it's always the same simple work over and over again.
6/Can this treatment method be changed?	No, it's already as basic and it gets.
7/ What about the volumes treated?	An ATM can face many different problems, mostly low levels of liquid, but also technical of all kinds, transactional, network, and others. We find issues about 50 times a day while supervising all 15 groups and 213 ATMs across the country
8/ Would a small automation improve this treatment process?	Wouldn't make much of a difference.
9/ Alright, do you see any profound system changes necessary?	Not at all.
10/ What is the current number of employees executing this process?	3 people.

11/ How much time does the whole process take?	Depending on the nature and if it can be resolved at our office, but the whole process takes about 20 minutes
12/Can it be done outside of work hours (8-16)?	Yes, definitely. A lot of times we come in the morning to find that issues happened during the night, so facing these issues 24 hours a day is needed.
13/Can you take us through the process, step by step?	Yes, for sure.

Source. made by researcher

The following table presents the details of the process:

Table 23. Steps of Execution of Process IV

Step	Duration
Detect problem from app or receive state from SATIM	10sec
Read state	2min
Check viability	3min
Treat state	6min
Divide and classify according to nature of issue	3min
Contact appropriate party	3min
Receive and go over final state	4min

Source. made by researcher

The overall process of monitoring and treating ATM issues takes 21 minutes and the level of process automation is 6/7 steps, as the field expert sees that the last step of going through the final state absolutely needs human intervention. Therefore, we can say that 90% of the process can be automated.

Table 24. Evaluation of Exception Rate of Process IV

Factor	Evaluation	Comment
Definition of the process	1	Availability of app defining each variable with a specific code and simplifying the steps of the process.
Field expert	1	Excellent knowledge of the process and availability to assist with the implementation project.
Process Complexity	1	Simple process with clear steps.
Application technology	1	Simple technology used.
Re-use of existing components	1	All the necessary components are existing and available.
Availability of materials	1	Computer equipment available.

Source. made by researcher

The evaluation of the exception rate of the complaint treatment process showed the following results:

- Definition of the process: this factor was evaluated with a score of 1, for the availability of the internal CPA application that already simplifies the steps of execution and specializes each variable with its specific code.
- Field expert: this factor was assessed with a score of 1, given their great knowledge of the process steps and details, and their willingness to participate in the project. This results in an exception rate reduction.
- Complexity of the process: this factor was evaluated with a score of 1, as this process is simple with clear steps of execution that minimize the risk of exceptional cases.
- Application technology: this factor was evaluated with a score of 1, meaning that it does not generate exceptions due to the security system linkable to the robot.
- Reuse of existing components: this factor was evaluated with a score of 1, that is to say the necessary components already exist which leads to an exception reduction.
- Availability of equipment: this factor was evaluated with a score of 1 given the necessary hardware is already available.

The system exception level (i.e. cases where unanticipated system events occur) is around 0% (no exceptions) when the process is made operational in production.

1.4.2. Second Evaluation of Process IV (Assessment of Benefits and Complexity of the Process)

Done by following the same method and scale.

Benefits:

The evaluated factors of this process are presented in the following table:

Table 25. Evaluation of Profit Rate of Process IV

Criteria	Evaluation	Weighting of criteria
Number of employees executing the process	3	15%
Average treatment time	20 min	30%
Average volume of applications	50	10%
Error rate	10%	20%
Frequency of the process	Daily	20%

Source. made by researcher

As a result, the overall profit rate of the application treatment process amounts to 95%. (15%+30%+10%+20%+20%=95%). The benefits generated by this process are very satisfactory (high).

Complexity:

Evaluating the complexity of the fourth process is detailed in the following table:

Table 26. Evaluation of Complexity of Process IV

Criteria	Description	Evaluation	Criteria weighting
Dependence	Is there a dependence on other processes?	NO	00%
Constraints	Does the process face constraints?	YES	10%
Free text	Does the process include reading free texts?	NO	00%
Image reading	Does the process include reading images?	NO	00%
Number of steps	Number of steps in the process?	7	5%
Automated parts	Are there any parts of the process that are already automated?	NO	00%
App tech	What is the application used?	Internal application of CPA	20%
Test environment	Is there a test environment available?	YES	00%
Exception	Exception Rate	00%	00%

Source. made by researcher

After aggregating all the criteria rates obtained, the overall complexity rate of the application treatment process amounts to 35% (10%+5%+20%=35%). It appears that the complexity of the process is medium, requiring 3 weeks of development.

1.4.3. Process IV Evaluation Conclusion

Based on the Automation Quadrants presented in table 11, this process with medium complexity (35%) and high benefits (95% profit rate) falls into the "Accessible Opportunities" quadrant.

The development of the Robotic Process Automation (RPA) solution for this process is implemented using an agile approach. The consulting firm EY recommends the Scrum methodology as the appropriate agile framework for this context. The programming of the process is divided into three one-week sprints, allowing for iterative development and continuous improvement throughout the project lifecycle.

The following table represents the functions processed during each sprint:

Table 27. Sprints of Development of RPA Solution for Process IV

Sprint	Function(s) treated
Sprint 1	Login Problem detection
Sprint 2	State treatment Division
Sprint 3	Communication line

Source. made by researcher

After the finalization of the work relating to the infrastructure, the project to implement the RPA solution enters the final phase. Planned and done the same way as explained with the previous processes.

1.4.4. Comparative Analysis of Process IV

Table 28 presents the As-Is and To-Be comparison between human capacity and robot capacity.

It is important to note that the working time per day is 7 hours (1 hour break).

Table 28. As-Is and To-Be Comparison of Process IV

	As-Is Process (pre-robotic automation)	To-Be Process (post-robotic automation)
Number of executors	3 employees	1 bot
Execution time	21 min per application	Estimated 7 secs per application + 2 non-automatable minutes
Precision	Can make mistakes	100% precision
Number of application	Average of 50 per day	Average of 50 per day
Efficiency calculation	21 × 50 = 1050 minutes 1050 / 3 employees = 350 minutes ~ 6 and a half hours per employee.	7 sec × 50 = 350 sec = 6 minutes 2 min × 50 = 100 100 + 6 = 106 min 106 / 3 employees = 35,33 ~ 35 minutes per employee.

Source. made by researcher

The comparison shows that the treatment of 50 issues per day takes around 6 and a half hours, but can be done, in the case of RPA, in a little over 35 minutes, including the non-automatable time, saving up huge amounts of time with zero error rate.

Section 2 : Proof of Concept

The EY office suggests that PoC should be more about business than technology. PoC for RPA is not only about proving that the technology works, it is also about proving that RPA is appropriate for the business. The primary focus in a PoC should be on preparing the bank for all requirements needed for RPA based on the process assessment. The three main sides to this PoC are the studies of IT, change management, and the financial readiness for an RPA adoption. To properly analyze each face of this PoC study, semi-structured interviews and meetings were conducted with executives and employees to gain the broadest view possible.

2.1. Organizational Change Management

The following table presents the results of the interviews conducted and meetings held studying the organizational change aspect of our feasibility study. The results were not divided by interviews to avoid repetitions, as we did find many similarities in arguments and concerns from interviewees regarding some of the points discussed.

Table 29. Organizational Change

Interviewees	Main points discussed	Arguments of interviewees	Concerns for RPA implementation	Suggested solutions or risk mitigation strategy
Executives: **Mr. SNOUCI** **Ms. KASSALI** **Employees:** **Mr. KALI** **Ms. BELAID** **Mr. IGUEMLAIEN**	Pain points of processes	A significant portion of the workload involves manually entering and reconciling data, which results is time consumption and elevated risk of errors. Heavy reliance on handoffs between different teams, leading to delays and errors. Handling customer inquiries and resolving transaction disputes often requires manual intervention and cross-departmental coordination. Growth of workload results in struggles in keeping pace without increasing staffing levels.	Misidentifying processes, process complexity, and exceptions handling. Data quality. Governance and monitoring of RPA solution and processes. Ensuring business continuity and having disaster recovery plans. Exceptions of unknown type.	The EY team will be responsible for evaluating each process for both timeliness and relevance. Highly complex processes are best addressed when the organization's RPA maturity is high. Provide clear understanding of the requirements of candidate processes and conduct a thorough analysis and process assessment, and use process mining tools to accurately map out current workflows. Start with a pilot program for a selected few processes to test the RPA system in a controlled environment. Produce reliable documentation clearly defining each process, and ensure fallback mechanisms where human intervention can take over.

				Establish a data governance framework to define data quality standards. Establish a dedicated RPA governance team responsible for overseeing the implementation, maintenance, and optimization. Conduct regular reviews and reporting on RPA performance The expertise of the EY team, acquired from previous interventions, allows it to cope with any hazards that may arise.
	Benefits expected	Bots handling high volumes of workloads and operating 24/7. Drastic reduction of errors. Provision of an audit trail and maintaining detailed logs of all activities. Eliminating the need for additional staffing. Faster transaction processing, treatment, and quicker responses to customer inquiries, enhancing client satisfaction and trust in the bank.	//	Conducting detailed planning and extensive testing before full-scale implementation. Setting scalable RPA solutions and ensuring they are designed to be flexible, allowing for easy updates and reconfiguration. Maintaining open lines of communication with all parties to manage expectations, address concerns, and provide regular updates.

		Focusing the human power on more strategic, value-added activities. Job satisfaction when relieving employees of tedious tasks and engaging them in more meaningful and progressive work.		
	Personnel competencies	Developing strong RPA competencies positions the bank as a leader in financial technology, providing a competitive edge and the ability to offer innovative services. Skilled personnel are crucial for ensuring that RPA systems comply with the CPA's standards and effectively manage operational risks. Using RPA can provide valuable development opportunities that enhance the career growth of employees. RPA reduces the workload on employees.	Lack of necessary competencies can result in underutilizing the full potential of RPA and risks challenges. Inadequate training and support to manage new RPA systems effectively.	Work with EY to develop customized training programs that align with the specificities of the processes and personnel of the CPA's monetics department. Organize workshops and simulations where employees can practice using RPA tools in a simulated environment. Implement a performance evaluation system that includes assessments of employees' RPA competencies and skill development. Provide constructive feedback and recognition for achievements to motivate employees. Organize knowledge transfer sessions with EY consultants. The expertise acquired during previous interventions by the EY team allows it to deal with hazards that may arise during the project.

	Resistance to change	Employees fear that automation will lead to job losses or reduced job security. Employees feel that they lack the necessary skills to work with RPA and are concerned about the adequacy of training. Possible anxiety caused by uncertainty. Lack of understanding for the benefits and reasons for RPA implementation. Resistance is natural, but is not reason to derail the digital transformation efforts. Director assured that employees will not be subject to job loss, rather to redeployment. Director showed his belief and trust in the employees' versatility and their competencies in adapting to any job descriptions and redeployment. Director expressed the importance that must be given to communication and internal marketing. Director did not express any major concerns as the added values are of much more importance.	The implementation phase will increase employees' workload and stress levels. Lack of motivation from employees to collaborate or engage in the implementation process. Employees' unwillingness to share domain knowledge and expertise.	Maintain open lines of communication, clearly articulate the benefits of RPA, and involve employees in the planning and implementation process. Involve employees in the planning and decision-making processes related to RPA implementation. Partner with EY to develop and deliver comprehensive training programs, and provide hands-on training sessions and workshops. Reassure employees that RPA is intended to complement their roles, not replace them, and highlight opportunities for job enrichment and career growth. Implement a structured change management plan that includes support mechanisms such as counseling and stress management programs. Establish performance metrics and communication lines to gather feedback from employees. Recognize and reward employees who actively participate in the RPA implementation process and demonstrate adaptability. Address concerns, misconceptions, and uncertainties through open

				dialogues, town halls, and feedback sessions. Maintain transparency throughout the process and share regular updates on progress and achievements. Plan sessions with EY consultants sharing experiences and success stories for reassurance and better understanding.
	Strategic alignment	Director sees the implementation of RPA as a main axis in the bank's broader digital transformation strategy for 2023-2025. RPA can contribute to achieving some of the bank's goals quicker. RPA provides the scalability needed to handle increasing workload volumes and business growth. No strategic objectives stated that would be disturbed by RPA implementation.	Failed implementation project may set back the bank's objectives.	Communicate the RPA vision across all levels of the bank to ensure alignment. Engage all parties in the implementation process and give routine updates.
	Failed implementation	Possibility of lack of involvement from stakeholders or EY team. Director showed faith in his team's ability in managing the project. Clear Objectives and Scope.	//	Defining key performance indicators (KPIs) and metrics to measure the success of the RPA implementation. Continuous monitoring and CoE. Involve key stakeholders from the beginning and maintain regular communication throughout the project.

	Long-term views	Establish Crédit Populaire d'Algérie Bank as a leader in digital banking and innovation. Achieve sustained improvements in operational efficiency, accuracy, and productivity. Create seamless, responsive, and high-quality customer interactions, increasing customer satisfaction and loyalty. Develop intelligent automation solutions that can handle more complex, cognitive processes. Build a robust automation infrastructure that can easily accommodate new processes and technologies. Foster a culture of continuous innovation and improvement. Foster an environment where employees are motivated to innovate and improve processes. Expand RPA solutions to new areas of the bank.	//	//

Source. made by researcher

Implementation roadmap

In order to enable feedback and continuous learning, the implementation method set by the consulting firm EY is based on an iterative, semi-agile approach throughout the automation life cycle. Therefore, the success of the integration of an RPA solution on behalf of the bank will be determined at the end of the 6 phases:

- Assessment and selection of processes with high automation potential;

- Definition of the solution architecture;

- Preparation of the infrastructure;

- Development of the solution and performance of tests;

- Establishment of a center of excellence (Cde) and formalization of the project (Go Live);

- Support and assistance.

The deployment of Robotic Process Automation (RPA) technology is very rapid compared to other digitalization projects. In fact, three and a half months are enough between the moment when the manual processes are identified and the commissioning of the software robots. For greater clarity, Figure 15 summarizes the suggested RPA implementation project schedule.

Figure 14. Macro Planning of Implementation Project

	W1	W2	W3	W4	W5	W6	W7	W8	W9	W10	W11	W12	W13	W14
Process assessment	■	■												
Definition of solution architecture			■											
Process I development				■	■	■	■							
Recipe							■							
Process III development				■	■	■	■	■	■					
Recipe									■					
Process IV development				■	■	■								
Recipe						■								
Infrastructure preparation										■				
CoE (preparation GoLive)											■	■	■	■

Source. EY representatives

Disclaimer: It is important to note that, in adherence to a non-disclosure agreement, the researcher refrains from disclosing the full details of the macro processes involved in the Security Subscription Service project. This commitment to confidentiality arises from the sensitivity of the information and the ongoing nature of the project.

Project Team

EY constantly monitors developments in the RPA solutions market in order to offer its clients the most suitable solutions.

The suggested EY project team responsible for implementing the RPA solution and the missions assigned to the members are presented in table 30.

Table 30. Suggested EY Project Team

Members	E-Mails	Roles
Mr. Mohamed ABOURA	Mohamed.aboura@dz.ey.com	Evaluate candidate business processes. Design the architecture of the RPA solution. Carry out robot development and testing. Drive change within the bank. Train CPA's IT teams on RPA. Set Center of Excellence and assist after implementation.
Mr. Abdelkrim BAHMED	Abdelkrim.bahmed@dz.ey.com	
Mr. Abderahmane CHENIKI	Abderrahmane.cheniki@dz.ey.com	
Mr. Fayçal Islam MERZOUKA	Faycal.islam.merzouga@dz.ey.com	

As for the bank's side, the director assured the availability and readiness of 2 possible project managers picking a team from 12 engineers, 7 technicians, and 2 administrators.

2.2. Financial Management

The main costs to consider when executing the financial study for this RPA implementation project are the software and licensing fees, the EY fees consisting of consulting, process analysis, bot development and customization, initial implementation and support, training fees, and project management fees. There are no hardware fees to consider as the bots are to be integrated with CPA's existing servers and internal applications.

Although the details of the financial study for the implementation project were held from us for confidentiality reasons, the director, Mr. SNOUCI, showed confidence in the bank's ability to adopt and invest on the RPA implementation project. After online back-and-forth between himself, Mr. Brahim MADDI, the head of accounting and contract management department, and the EY representative. In fact, Mr. SNOUCI showed excitement regarding the sensibility of improved efficiency and reduced operational costs.

When discussing the return on investment, Mr. SNOUCI provided us with several non-conventional ways that ROI can manifest itself, including major time gain, resource optimization, and service quality improvement.

"The return on investment is not direct for this kind of project, we need to see the bigger picture."

– Mr. SNOUCI

The detection of this ROI is done by defining and using key performance indicators KPIs, and establishing a CoE for continuous monitoring from both parties, EY and CPA.

2.3. IT Management

The RPA solution proposed by the EY consultancy firm for the bank's processes is UiPath, for several compelling reasons. Firstly, the UiPath software offers a comprehensive suite of activities tailored for automation, making it an accessible platform for first-time RPA users. Additionally, it provides the capability for remote access, enabling seamless collaboration and monitoring. Notably, UiPath's integration capabilities allow interactions with other applications, which is crucial for retrieving and transmitting files. Furthermore, the platform offers free training resources through the UiPath Academy website, facilitating upskilling and knowledge transfer.

It is imperative to emphasize that the RPA implementation project does not necessitate additional hardware investments, as the developed bots will be integrated into the bank's existing internal applications and server infrastructure.

Mr. SNOUCI expressed, during one of the interviews, confidence in his team's competencies, which comprise 12 engineers and 7 technicians, to undertake this project successfully.

The engineering team has highlighted the simplicity of their expected workload, as the EY team will be primarily responsible for the development and personalization of the robots (a bot per process). The bank's IT team's primary responsibilities will be continuous monitoring, issue resolution, and ensuring smooth data flow and interoperability after the initial implementation.

Other important responsibilities include undertaking additional projects related to the main RPA implementation, managing and providing access to necessary connectors that RPA bots will utilize to interact with other systems, and managing changes to the RPA system, such as updates, upgrades, and modifications, in a controlled and documented manner. Additionally, the team will be responsible for communicating regular status and performance updates to project parties and executives.

Regarding data security, the engineering team has expressed no concerns, given the robustness of the bank's existing security veil.

Section 3 : Discussion

Like all banks, Crédit Populaire d'Algérie places a strong emphasis on digitalization and electronic payment systems, driving the need for continuous business process enhancement and significant efforts in digitalization strategies.

In this section, we present and discuss key findings from our study on implementing Robotic Process Automation (RPA) at CPA Bank. We analyze these findings in the context of existing literature on RPA adoption and organizational change management, providing tailored suggestions to maximize benefits and mitigate challenges. Our discussion aims to contribute valuable insights into the bank's pursuit of operational excellence through intelligent automation.

Our research evaluates the possibility of implementing RPA in CPA's MM department, focusing on potential benefits and challenges. We developed two main study inquiries using interviews, observations, and document analysis from CPA and EY. The first examines identified processes for automation suitability, complexity, benefits, and exception cases. The second assesses CPA's readiness for transformation in terms of organizational change, financial implications, and technological shift associated with RPA adoption.

We aim to understand how RPA could transform operational processes, opportunities, and challenges for involved employees. Additionally, we assess financial implications, both initial investment and long-term efficiency gains, as well as organizational change management aspects, including employee readiness, training requirements, and fostering a culture of innovation and continuous improvement. We also explore IT infrastructure considerations, evaluating existing systems' compatibility with RPA solutions and necessary measures for seamless integration and data security.

Business Process Efficiency

The investigation into the MM department's business processes revealed that many are highly manual, leading to inefficiencies and a high potential for errors. Four processes were assessed, and three were identified as suitable for robotic process automation (RPA). One example is the process of handling applications for Electronic Payment Terminals (EPTs), which involves substantial manual data entry and reconciliation. Automating these processes with RPA would reduce errors and expedite the workflow. This recommendation is supported by similar findings in previous studies, such as the automation of loan monitoring processes in banks (Nikolaidou, ANAGNOSTOPOULOS, & TSALGATIDOU, 2006).

Employee Workload and Satisfaction

Employees in the MM department are burdened by extensive manual processing tasks, which are time-consuming and monotonous, leading to decreased job satisfaction and increased burnout. These repetitive tasks occupy a significant portion of their workday, preventing them from engaging in strategic, value-added activities. Implementing Robotic Process Automation (RPA) can automate these routine tasks, such as the complete automation of the ATMs supervision process. This would free up employees' time for more complex and strategic tasks requiring human judgment and creativity, thus improving operational efficiency and enhancing job satisfaction. This approach aligns with Trkman's findings of 2010 on the benefits of task-technology alignment in boosting employee morale and organizational performance, creating a more dynamic and fulfilling work environment.

Business Process Assessment and Evaluation

The employed approach incorporates interviews with employees to gain insights into the current operational landscape. Through this approach, manual processes such as ATM supervision, complaint treatment, and EPT application treatment, were identified as prime candidates for automation. The initial assessment follows the guide of figure 1, and the evaluation criteria and weightings used for process prioritization were provided by the EY office, with specific calculations kept confidential, ensuring a systematic and objective evaluation process.

A detailed analysis of each identified process is carried out to understand its current state "As Is". Once this initial assessment is done, processes that can be automated are identified, taking them to the next steps of evaluation.

Concurrently, quantitative data related to process performance metrics, such as execution time, error rates, and resource utilization, were collected to establish a baseline for comparison before and after automation.

The analysis revealed significant inefficiencies such as time-consuming tasks and error-prone activities. Stakeholder interviews provided valuable perspectives on the challenges faced in executing these manual processes. The identification of these pain points underscored the potential benefits of RPA.

Through in-depth interviews with the employees responsible for executing each business process, and based on the evaluation results, the processes were found to present substantial potential gains with moderate complexity.

To automate, development plans must be outlined following the agile Scrum methodology recommended by EY. Development plans consist of several one-week sprints, each focusing on specific functions. This iterative approach allows for incremental development and testing of the RPA solution to ensure functionality and performance.

Furthermore, as part of the final phase of the RPA implementation project, bank employees involved in executing automated processes were scheduled to undergo two training courses. The first training focuses on technical aspects of UiPath, for process development and debugging, while the second training aims at facilitating change management within the organization to adapt to working with software robots effectively.

Comparative Study

The comparative study delves into assessing the impact of RPA on various business processes. By conducting the analysis between the current "As Is" processes and the proposed "To Be" processes enhanced through RPA. By comparing metrics such as execution time, precision, and overall efficiency, the study sought to highlight the potential productivity gains and time savings achievable through automation. The comparison reveals that a bot can process the same volume of applications as several human employees, in significantly less time, and with 100% precision compared to the human employees who can make errors costing the department time, effort and reduced customer satisfaction. This comparison helps stakeholders make informed decisions about investing in RPA technologies and optimizing resource allocation for maximum efficiency and profitability.

Overall, the comparative study between the current manual processes "As-Is" and the envisioned automated processes "To-Be" showcases the transformative impact of RPA on operational workflows. By aligning the identified manual tasks with the capabilities of RPA solutions, the study demonstrates a clear pathway for enhancing operational effectiveness and productivity in the MM department. These findings not only validate the need of RPA implementation, but also provide a compelling case for leveraging automation to drive operational excellence and strategic value in banking processes.

Change Management

The investigation into change management for the RPA implementation project in CPA's MM department revealed several key strategies to address concerns and ensure successful adoption:

To mitigate risks and concerns surrounding RPA implementation, involving the EY team for process evaluation, utilizing process mining tools for workflow mapping, and starting with a pilot program in a controlled environment were suggested. This approach aimed to provide a clear understanding of candidate processes and identify potential areas for automation while minimizing disruptions.

For personnel competencies, tailored training programs, workshops, and simulations were recommended to enhance employees' RPA skills and proficiency. Performance evaluations and knowledge transfer sessions with EY consultants were proposed to provide employees with the necessary expertise to effectively manage RPA systems and address operational hurdles.

To manage resistance to change, strategies included open communication, involving employees in decision-making processes, and offering tailored training programs to address skill inadequacies. Support mechanisms such as counseling and stress management initiatives were advocated to help employees navigate the transition smoothly and alleviate concerns about job losses or increased workload.

Strategies for strategic alignment focused on proactive communication and stakeholder engagement to ensure alignment with the bank's broader digital transformation strategy. Establishing key performance indicators, continuous monitoring, and the establishment of a Center of Excellence were recommended to measure the success of RPA implementation and ensure alignment with strategic objectives.

In the long term, CPA aims to foster a culture of continuous innovation and expand RPA solutions across the bank. This involves sustained efforts to improve operational efficiency, enhance customer interactions, and develop intelligent automation solutions to solidify their position as a leader in digital banking innovation.

Implementation Roadmap

The consulting firm EY proposes an iterative approach for RPA implementation across 6 phases in a 14-week macro planning. The details of this planning were kept from us for confidentiality reasons, but we managed to get a suggested team to work on the RPA implementation project for CPA, consisting of four members.

On the bank's side, the director has assured the availability and readiness of two potential project managers, who will get to assign a team from 12 engineers, 7 technicians, and 2 administrators available, to support the RPA implementation project.

Financial Management

The primary costs associated with the RPA implementation project encompass software and licensing fees, along with consulting fees from EY for various services including process analysis, bot development, customization, initial implementation, and support. Additionally, training fees and project management fees are included. It's noteworthy that there are no additional hardware costs as the bots will integrate with the existing servers and internal applications of the bank. Although the specific financial details remain confidential, Mr. SNOUCI, the director, expressed confidence in the bank's capacity to adopt and invest in the RPA project. In discussions about return on investment (ROI), Mr. SNOUCI emphasized the diverse ways ROI can manifest, such as time savings, resource optimization, and service quality enhancement. ROI detection can be facilitated through the definition and monitoring of key performance indicators (KPIs), alongside the establishment of a Center of Excellence for continuous monitoring by both EY and the bank.

IT Management

The recommended RPA solution by EY is UiPath, and was selected for its extensive range of capabilities, features, and offers. Mr. SNOUCI conveyed his confidence in the bank's IT team, to proficiently execute the project. While the EY team will primarily focus on bot development and customization, post-implementation responsibilities will be managed by the bank's IT team.

Additionally, the bank's IT team will oversee tasks such as managing access to connectors for bot integration, implementing changes to the RPA system, and providing regular updates on status and performance.

In summary, this is only the beginning of the transformative journey for the MM department of CPA in the field of robotic process automation. We plan to follow this journey and keep a close eye on this implementation project, that has immense potential to revolutionize the department's operations.

The strategic collaboration with EY is a cornerstone of this initiative. EY's expertise will be crucial in navigating the complexities associated with RPA implementation. Their extensive experience positions them well to address any challenges that may arise, ensuring a smooth transition to automated processes. The bank’s IT team will play a pivotal role in continuous monitoring, issue resolution, and maintaining the RPA system post-implementation.

However, potential failures in implementation could arise from lack of stakeholder involvement, insufficient training, misidentification of processes for automation, and inadequate management of the RPA system post-implementation. These issues may stem from different factors, like poor communication, resistance to change, underestimating process complexity, and lack of ongoing support. To avoid these pitfalls, it is crucial to ensure continuous stakeholder engagement, involve key stakeholders in decision-making, and maintain regular communication throughout the project. Close monitoring and a good risk management plan are the way avoid any bumps along the road.

Leveraging the robust capabilities of the UiPath solution, the project is set for success. If executed correctly, this RPA adoption is expected to yield substantial benefits for Crédit Populaire d'Algérie. Enhanced operational efficiency, reduced error rates, and improved customer satisfaction are among the anticipated outcomes. The successful realization of these benefits will not only justify the investment but also position the bank as a leader in digital banking and innovation. This project marks the beginning of a significant shift towards a more efficient and technologically advanced operational framework for the bank.

Conclusion of Third Chapter

To comprehensively investigate the potential of RPA implementation at Crédit Populaire d'Algérie Bank, we developed several research inquiries. These inquiries involved examining the specific processes identified as candidates for automation and evaluating their suitability in terms of complexity, potential benefits, and exception handling. Our aim was to understand how the introduction of RPA could transform the bank's operational processes, as well as the key opportunities and challenges associated with this technological shift for the employees involved. Additionally, we sought to assess the financial implications of RPA adoption, both in terms of initial investment and long-term cost savings and efficiency gains. Furthermore, we explored the organizational change management aspects, including employee readiness, training requirements, and strategies to foster a culture of innovation and continuous improvement. We also delved into the IT infrastructure considerations, evaluating the bank's existing systems' compatibility with RPA solutions and the necessary measures to ensure seamless integration and data security. To tie it all together, we discussed the results found and data collected, and gave suggestions to CPA that we think will contribute to the success of this project. By addressing these research inquiries, we aimed to provide a holistic understanding of the impact of RPA implementation on Crédit Populaire d'Algérie Bank and the organizational transformations required for successful adoption.

Conclusion

The objective of this thesis was to investigate the feasibility and impact of implementing Robotic Process Automation (RPA) in the Monetics Management (MM) department at Crédit Populaire d'Algérie (CPA) Bank. The study aimed to identify specific processes suitable for automation, evaluate the potential benefits and challenges of RPA adoption, and provide strategic recommendations for effective implementation.

To achieve these objectives, a qualitative methodology was employed. Initially, a detailed literature review was conducted to understand the theoretical foundations and current state of RPA in the banking sector. This was followed by the review of case studies of other banks that had implemented RPA to identify best practices and potential pitfalls. Data collection involved interviews with key stakeholders within the CPA Bank, including executives and employees in the MM department, as well as the gathering of quantitative data on current processes and their efficiency. Additionally, process mapping and analysis were used to identify tasks within the MM department that were repetitive, rule-based, and time-consuming, making them prime candidates for automation.

The research revealed several key findings. Positively, the implementation of RPA in the MM department is projected to significantly increase efficiency by automating routine tasks, thus allowing employees to focus on more strategic activities. Furthermore, the need for significant changes in existing workflows, and potential resistance from staff need to be addressed from the get-go. Additionally, the success of RPA depends heavily on the robustness of the underlying IT infrastructure and the continuous monitoring and updating of automated processes to ensure they adapt to changing business needs.

The impact of this research on CPA Bank is substantial. By providing a clear roadmap for RPA implementation, the bank can strategically plan for a smoother transition to automated processes, enhancing overall productivity and competitiveness in the market. The insights gained from this study also highlight the importance of involving all stakeholders in the implementation process to mitigate resistance and ensure alignment with organizational goals. This adoption project is an important axis in the bank's digital transformation strategy.

This thesis represents the initial study for the RPA project at CPA Bank, laying the groundwork for future developments. Conducted in collaboration with Ernst & Young consultancy firm (EY), this study involved joint efforts in data analysis, process evaluation, and strategic planning. EY's expertise in RPA and digital transformation played a crucial role in shaping the research framework and validating the findings. The collaborative work ensured a robust and comprehensive assessment of the potential for RPA in the MM department, providing a strong foundation for subsequent phases of the project.

The next steps of the project involve detailed planning and phased implementation of RPA in the MM department, starting with the most promising processes identified during the research. It will be crucial to establish a dedicated RPA team within CPA Bank to oversee the implementation, provide ongoing support, and drive continuous improvement. Training programs for employees will also be essential to ensure a smooth transition and to empower staff to work alongside automated processes effectively.

However, there are areas that require further attention. it would be necessary to conduct a pilot project within CPA Bank to gather real-time data and insights that could refine the proposed implementation strategy. it would be necessary to conduct a pilot project within CPA Bank to gather real-time data and insights that could refine the proposed implementation strategy. Additionally, Future research should focus on the long-term effects of RPA on employee roles and satisfaction, the continuous improvement of RPA processes to adapt to evolving business environments, and the integration of RPA with other emerging technologies like Artificial Intelligence (AI) and Machine Learning (ML).

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Appendix : The Interview Guide

The Interview Guide (English Version):

I. For employees

Part 01: Warm-up

1. Can you introduce yourself, please?
2. Can you provide an overview of your professional profile, role, and responsibilities within the bank?
3. Have you ever heard of Robotic Process Automation?
4. What do you know about it?
5. Are you interested in discovering more about this automation?
6. Do you think your work would benefit from implementing an RPA solution?

Part 02: Initial evaluation of business processes

1. Do the following points apply to your process:

   Manual and repetitive process?

   Rule-based process?

   Electronic readable inputs?

   Standard inputs?

   Low complexity?

   Non-changeable treatment method?

   High volumes of treatment?

   Non-improvable by a small automation?

   Unnecessary profound system changes?

2. How much time does the whole process take?
3. Can it be done outside of work hours?
4. Can you take us through the process, step by step?

Part 03: Second evaluation of business processes

1. What's the frequency of the process (how many times a day/week)?
2. How long does the whole thing usually take?
3. How would you judge the error rate of the process?
4. Which steps absolutely need human intervention and which steps don't?
5. Is there a dependance on other processes?
6. Does the process face constraints (like a deadline, etc)?
7. Does the process include reading free texts?
8. Number of steps in the process?

9. Are there any parts of the process that are already automated?
10. What is the application used?
11. Is there a test environment available?
12. How frequently do you face exceptional cases?

Part 04: Organizational change

1. Have you had any previous experience with automation or RPA tools in your work?
2. How do you think RPA will affect your roles and responsibilities?
3. How do you feel about the potential implementation of RPA in your daily work?
4. What are your thoughts or concerns regarding the implementation of RPA in your work processes?
5. How can the organization address your concerns and support you through this potential change?
6. How do you think RPA implementation could benefit you and the organization as a whole?

II. For executives

Part 01: Warm-up

1. Can you kindly introduce yourself?
2. Can you provide an overview of your professional profile, role, and responsibilities within the bank?
3. Have you ever heard of Robotic Process Automation?
4. What do you know about it?
5. Are you interested in discovering more about this automation?
6. Do you think the MM department would benefit from implementing an RPA solution?

Part 02: Organizational change

1. How do you think RPA will affect employee roles and responsibilities?
2. What are your expectations and desired outcomes from implementing RPA?
3. How do you envision RPA fitting into your organization's overall digital transformation strategy?
4. Are you open to collaborating with the EY consulting firm for the RPA implementation project?
5. What are your concerns or potential challenges regarding the implementation of RPA in your organization?
6. How do you plan to manage change and ensure employee adoption of the new RPA-enabled processes?
7. What measures will you take to address potential job displacement concerns among employees due to automation?
8. Where do you anticipate the most resistance to change?

9. What communication strategies do you plan to use to inform and engage employees about RPA?
10. What steps will you take to ensure a smooth transition?
11. How do you plan to identify and address sources of resistance?
12. What are the main business processes or areas where you believe RPA could bring the most significant benefits?

Part 03: Finance

1. What is the estimated initial investment for RPA?
2. How do you expect RPA to impact efficiency and operational costs?
3. Are there specific areas where you anticipate significant cost changes?
4. What financial risks do you foresee with the implementation of RPA? How can you plan to mitigate these risks?
5. How do you think we can best measure the ROI of RPA?

Part 04: IT management

1. Can you describe the current IT infrastructure at Crédit Populaire d'Algérie?
2. What core banking systems and software are currently in use?
3. How many IT engineers do you currently have? Which ones would you volunteer for this project?
4. What do you anticipate as the main challenges in integrating RPA with existing systems?
5. Have there been any major technical issues or downtimes recently?
6. Do you have any specific concerns about implementing RPA regarding IT?

Le Guide d'Entretien (Version Française):

I. Pour les employés

Partie 01 : Réchauffement

1. Pouvez-vous vous présenter, s'il vous plaît ?
2. Pouvez-vous donner un aperçu de votre profil professionnel, de votre rôle et de vos responsabilités au sein de la banque ?
3. Avez-vous déjà entendu parler de l'automatisation robotique des processus ?
4. Qu'en savez-vous ?
5. Êtes-vous intéressé pour en découvrir davantage sur cette automatisation ?
6. Pensez-vous que votre travail bénéficierait de la mise en œuvre d'une solution RPA ?

Partie 02 : Évaluation initiale des processus métier

1. Les points suivants s'appliquent-ils à votre processus :

   Processus manuel et répétitif ?

   Processus basé sur des règles ?

   Entrées lisibles électroniquement ?

   Entrées standard ?

   Faible complexité ?

   Méthode de traitement non modifiable ?

   Volumes de traitement élevés ?

   Non améliorable par une petite automatisation ?

   Changements de système profonds inutiles ?

2. Combien de temps prend l'ensemble du processus ?
3. Peut-il être effectué en dehors des heures de travail ?
4. Pouvez-vous nous guider à travers le processus, étape par étape ?

Partie 03 : Deuxième évaluation des processus métier

1. Quelle est la fréquence du processus (combien de fois par jour/semaine) ?
2. Combien de temps dure généralement l'ensemble ?
3. Comment jugez-vous le taux d'erreur du processus ?
4. Quelles étapes nécessitent absolument une intervention humaine et lesquelles n'en nécessitent pas ?
5. Existe-t-il une dépendance vis-à-vis d'autres processus ?
6. Le processus fait-il face à des contraintes (comme une échéance, etc.) ?
7. Le processus inclut-il la lecture de textes libres ?
8. Nombre d'étapes dans le processus ?

9. Certaines parties du processus sont-elles déjà automatisées ?
10. Quelle est l'application utilisée ?
11. Un environnement de test est-il disponible ?
12. À quelle fréquence faites-vous face à des cas exceptionnels ?

Partie 04 : Changement organisationnel

1. Avez-vous une expérience précédente avec des outils d'automatisation ou de RPA dans votre travail ?
2. Comment pensez-vous que la RPA affectera vos rôles et responsabilités ?
3. Comment vous sentez-vous face à la mise en œuvre potentielle de la RPA dans votre travail quotidien ?
4. Quelles sont vos réflexions ou préoccupations concernant la mise en œuvre de la RPA dans vos processus de travail ?
5. Comment l'organisation peut-elle répondre à vos préoccupations et vous soutenir dans ce changement potentiel ?
6. Comment pensez-vous que la mise en œuvre de la RPA pourrait vous bénéficier ainsi qu'à l'organisation dans son ensemble ?

II. Pour les cadres

Partie 01 : Réchauffement

1. Pouvez-vous vous présenter, s'il vous plaît ?
2. Pouvez-vous donner un aperçu de votre profil professionnel, de votre rôle et de vos responsabilités au sein de la banque ?
3. Avez-vous déjà entendu parler de l'automatisation robotique des processus ?
4. Qu'en savez-vous ?
5. Êtes-vous intéressé pour en découvrir davantage sur cette automatisation ?
6. Pensez-vous que le département de la monétique bénéficierait de la mise en œuvre d'une solution RPA ?

Partie 02 : Changement organisationnel

1. Comment pensez-vous que la RPA affectera les rôles et responsabilités des employés ?
2. Quels sont vos attentes et résultats souhaités de la mise en œuvre de la RPA ?
3. Comment envisagez-vous l'intégration de la RPA dans la stratégie globale de transformation numérique de votre organisation ?
4. Êtes-vous ouvert à une collaboration avec le cabinet de conseil EY pour le projet de mise en œuvre de la RPA ?
5. Quelles sont vos préoccupations ou défis potentiels concernant la mise en œuvre de la RPA dans votre organisation ?
6. Comment prévoyez-vous de gérer le changement et d'assurer l'adoption par les employés des nouveaux processus avec la RPA ?

7. Quelles mesures prendrez-vous pour répondre aux inquiétudes potentielles des employés concernant le déplacement des emplois dû à l'automatisation ?
8. Où anticipez-vous la plus grande résistance au changement ?
9. Quelles stratégies de communication prévoyez-vous d'utiliser pour informer et impliquer les employés sur la RPA ?
10. Quelles étapes prendrez-vous pour assurer une transition en douceur ?
11. Comment prévoyez-vous d'identifier et d'aborder les sources de résistance ?
12. Quels sont les principaux processus métier ou domaines où vous pensez que la RPA pourrait apporter les bénéfices les plus importants ?

Partie 03 : Finance

1. Quel est l'investissement initial estimé pour la RPA ?
2. Comment pensez-vous que la RPA impactera l'efficacité et les coûts opérationnels ?
3. Y a-t-il des domaines spécifiques où vous anticipez des changements de coûts importants ?
4. Quels risques financiers prévoyez-vous avec la mise en œuvre de la RPA ? Comment pouvez-vous planifier pour atténuer ces risques ?
5. Comment pensez-vous que nous pouvons au mieux mesurer le retour sur investissement de la RPA ?

Partie 04 : Gestion des systèmes d'information

1. Pouvez-vous décrire l'infrastructure informatique actuelle au Crédit Populaire d'Algérie ?
2. Quels systèmes bancaires principaux et logiciels sont actuellement utilisés ?
3. Combien d'ingénieurs informatiques avez-vous actuellement ? Lesquels proposeriez-vous pour ce projet ?
4. Quels sont, selon vous, les principaux défis de l'intégration de la RPA avec les systèmes existants ?
5. Y a-t-il eu des problèmes techniques majeurs ou des temps d'arrêt récemment ?
6. Avez-vous des préoccupations spécifiques concernant la mise en œuvre de la RPA en ce qui concerne les systèmes d'information ?