

Democratic and Popular Republic of Algeria
Ministry of Higher Education and Scientific Research
University of Relizane
Faculty of Commerce, Economics, and Management Sciences
Department of Economics



**The Impact of Technological Innovations on Enhancing the
Efficiency of Algerian Banks:
A Case Study of Crédit Populaire d'Algérie**

*Thesis Submitted to the Department of Economics in Partial Fulfillment of the Requirements
for the Degree of Master in Monetary and Financial Economics*

Submitted by:

MEGUENNI Sid Ali

Supervised by:

Dr. DJALLAM Karima

Board of Examiners:

Chairwoman:

Pr. MORTET Sabrina

University of Relizane

Supervisor:

Dr. DJALLAM Karima

University of Relizane

Examiner:

Pr. ARABECHE Zina

University of Relizane

2024/2025

DEDICATION

I dedicate this thesis to my beloved family, whose unwavering support has been the cornerstone of my academic journey. To my parents, whose wisdom has guided me throughout life.

ACKNOWLEDGEMENTS

I would like to express my sincerest gratitude to my supervisor, Dr. Karima Djallam, for her guidance, insightful feedback, and constant support throughout this research. Her expertise and mentorship were instrumental in shaping this thesis.

Special thanks are extended to the staff of Crédit Populaire d'Algérie (CPA), particularly the Relizane branch director and the executive at the Directorate of Marketing and Communication. Their cooperation, willingness to share insights, and facilitation of access to critical data were indispensable to the success of this study.

Finally, I am thankful to everyone who contributed, directly or indirectly, to the successful completion of this thesis.

Abstract

This study assessed the impact of technological innovations on the efficiency of Crédit Populaire d'Algérie (CPA), considering perspectives from its Relizane branch and Directorate of Marketing and Communication. Specific objectives included evaluating effects on resource utilization, transaction processing speed, employee productivity, service quality/customer experience, and identifying barriers to technology adoption.

The research employed a quantitative, descriptive-analytical design with a cross-sectional survey of CPA employees. Data were collected via a structured questionnaire and an interview with the Relizane Branch Director, then analyzed using descriptive statistics, reliability tests, and simple linear regression (SPSS).

Key findings revealed that technological innovation significantly enhances CPA's overall perceived efficiency ($p=.026$). A significant positive impact was observed on perceived service quality and customer experience ($p=.015$), which was the most robust finding. However, no statistically significant impact was found on perceived resource utilization ($p=.186$), transaction processing speed ($p=.163$), or employee productivity ($p=.118$), indicating a 'Perception-Implementation Gap' despite positive perceptions. Perceived barriers to adoption (regulatory, customer literacy/trust, cash culture) were deemed highly important by employees but did not significantly affect current overall efficiency ($p=.760$), suggesting a 'Latent Drag' on future potential.

The study concludes that technological innovation primarily boosts CPA's efficiency through service quality enhancements. The gap in internal efficiencies highlights a need for deeper process re-engineering. Existing barriers, while not immediately degrading current efficiency, pose long-term constraints. These outcomes are contextualized by TAM, DOI, and RBV theories.

Keywords: Technological Innovation, Bank Efficiency, Crédit Populaire d'Algérie (CPA), Digital Banking, Algeria

هدفت هذه الدراسة إلى تقييم أثر الابتكارات التكنولوجية على الكفاءة للقرض الشعبي الجزائري، مع الأخذ في الاعتبار وجهات نظر من فرعه في غليزان ومديرية التسويق والاتصال. وشملت الأهداف المحددة تقييم الآثار على كفاءة استخدام الموارد، وسرعة معالجة المعاملات، وإنتاجية الموظفين، وجودة الخدمة وتجربة العملاء، وتحديد معوقات تبني التكنولوجيا.

اعتمد البحث تصميمًا كميًا وصفيًا تحليليًا مع استقصاء مقطعي لموظفي البنك. جمعت البيانات عبر استبيان منظم ومقابلة مع مدير فرع غليزان، ثم حللت باستخدام الإحصاء الوصفي، واختبار الموثوقية، والانحدار الخطي البسيط (SPSS).

كشفت النتائج الرئيسية أن الابتكار التكنولوجي يعزز بشكل كبير الكفاءة الكلية المتصورة للبنك ($p=.026$). لوحظ تأثير إيجابي كبير على جودة الخدمة المتصورة وتجربة العملاء ($p=.015$)، وكانت هذه النتيجة الأكثر قوة. ومع ذلك، لم يوجد تأثير ذو دلالة إحصائية على كفاءة استخدام الموارد المتصورة ($p=.186$)، أو سرعة معالجة المعاملات ($p=.163$)، أو إنتاجية الموظفين ($p=.118$)، مما يشير إلى "فجوة بين التصور والتنفيذ" على الرغم من التصورات الإيجابية للأدوات الفردية. المعوقات المتصورة للتبني (تنظيمية، معرفة العملاء الرقمية والثقة، ثقافة النقد) اعتبرت ذات أهمية عالية من قبل الموظفين ولكنها لم تؤثر بشكل كبير على الكفاءة الكلية الحالية ($p=.760$)، مما يوحي بـ"معاوقة كامنة" على الإمكانيات المستقبلية.

توصلت الدراسة إلى أن الابتكار التكنولوجي يعزز كفاءة البنك بشكل أساسي من خلال تحسين جودة الخدمة وتجربة العملاء. الفجوة في الكفاءات الداخلية تسلط الضوء على الحاجة إلى إعادة هندسة أعمق للعمليات. المعوقات القائمة، رغم أنها لا تقلل فوراً من الكفاءة الحالية، تفرض قيوداً على المدى الطويل. هذه النتائج تم تأطيرها نظرياً باستخدام نماذج قبول التكنولوجيا (TAM)، وانتشار الابتكارات (DOI)، والنظرة القائمة على الموارد (RBV).

الكلمات المفتاحية: الابتكار التكنولوجي، كفاءة البنوك، القرض الشعبي الجزائري، الخدمات المصرفية الرقمية، الجزائر

List of Acronyms and Abbreviations

Acronym/Abbreviation	Full Form
ATM	Automated Teller Machine
CPA	Crédit Populaire d'Algérie
DOI	Diffusion of Innovation
EP	Employee Productivity
FinTech	Financial Technology
IMF	International Monetary Fund
IT	Information Technology
POS	Point of Sale
PEOU	Perceived Ease of Use
PU	Perceived Usefulness
RBV	Resource-Based View
RU	Resource Utilization
SQ	Service Quality
TAM	Technology Acceptance Model
TI	Technological Innovation
TP	Transaction Processing
VRIN	Valuable, Rare, Imperfectly imitable, and Non-substitutable

List of Tables

Table 2.1 Types of Technological Innovation in Banking.....	27
Table 2.2 Comparative Metrics of Bank Efficiency:	30
Table 2.3: Summary of Key Empirical Findings from Previous Studies.....	36
Table 3.1: Five-Point Likert Scale Interpretation.....	47
Table 3.2: Internal Consistency Reliability (Cronbach’s Alpha).....	48
Table 3.3: Questionnaire Distribution and Response Rate	50
Table 3.4: Frequency and Percentage Distribution of Respondents by Demographic Variables ..	51
Table 3.5: Descriptive Statistics for Technological Innovation items	53
Table 3.6: Descriptive Statistics for Resource Utilization Items	55
Table 3.7: Descriptive Statistics for Transaction Processing Speed Items	57
Table 3.8: Descriptive Statistics for Employee Productivity Items	58
Table 3.9: Descriptive Statistics for Service Quality and Customer Experience Items	60
Table 3.10: Descriptive Statistics for Barriers to Adoption Items	61
Table 3.11: Summary of Interview with CPA Relizane Branch Director.....	62
Table 3.12: CPA Investment and Revenue from Monetics and Digital Services (2021-2024)	65
Table 3.13: CPA Key Performance Indicators: Monetics and Digital Services (2021-2024)	65
Table 3.14: Regression Analysis of TI predicting Overall Efficiency	66
Table 3.15: Regression Analysis of BR predicting Overall Efficiency	67
Table 3.16: Regression Analysis of TI predicting RU	67
Table 3.17: Regression Analysis of TI predicting TP.....	68
Table 3.18: Regression Analysis of TI predicting EP.....	68
Table 3.19: Regression Analysis of TI predicting SQ	69

List of Figures

Figure 3.1: Conceptual Framework.....	42
---------------------------------------	----

Table of Contents

Dedication	i
Acknowledgements	ii
Abstract	iii
List of Acronyms and Abbreviations.....	iv
List of Tables.....	v
List of Figures.....	vii
Table of Contents.....	x
CHAPTER ONE: GENERAL INTRODUCTION	x
1.1 Background of the Study.....	1
1.1.1 Banking Industry in Algeria.....	6
1.1.2 Infrastructure Development.....	8
1.1.3 Overview of CPA Bank.....	10
1.2 Problem Statement	12
1.3 Objectives of the Study	13
1.4 Research Questions	13
1.5 Hypotheses	14
1.6 Significance of the Study	15
1.7 Scope and Limitations of the Study	15
1.8 Organization of the Study	16
CHAPTER TWO: LITERATURE REVIEW AND PREVIOUS STUDIES.....	18
2.1 Introduction	19
2.2 Theoretical Frameworks.....	19
2.2.1 Technology Acceptance Model (TAM).....	19
2.2.1.1 Application to Banking Contexts	20
2.2.2 Diffusion of Innovation (DOI) Theory.....	21
2.2.2.1 Application to Banking Contexts	22
2.2.3 Resource-Based View (RBV)	23
2.2.3.1 Application to Banking Contexts	24
2.3 Empirical Literature Review	25
2.3.1 Technological Innovation in Banking	25
2.3.2 Bank Efficiency.....	28
2.3.3 Importance of Bank Efficiency	31
2.3.4 The link between Technological Innovation and Bank Efficiency	32
2.3.5 Technological Innovation and Efficiency Metrics	33

2.3.6 Previous Studies	36
2.4 Conclusion of Literature Review And Previous Studies.....	39
CHAPTER 3: EMPRICAL STUDY AND DATA ANALYSIS	40
3.1 Introduction	41
3.2 Research Methodology.....	41
3.2.1 Research Design.....	41
3.2.2 Study Population and Sample	44
3.2.3 Data Sources.....	44
3.2.4 Data Collection Instrument	46
3.2.5 Validity and Reliability	47
3.2.6 Data Analysis Techniques.....	48
3.3 Study Results.....	50
3.3.1 Descriptive Analysis of Demographic Variables	51
3.3.2 Descriptive Statistics of Main Variables.....	53
3.3.3 Presentation of Interview Data: CPA Relizane Branch Director	62
3.3.4 Supporting Financial Data: CPA's Technological Investments and Performance	64
3.3.5 Hypothesis Testing:.....	66
3.4 Results Discussion.....	69
3.4.1 Introduction to the Results Discussion.....	69
3.4.2 Discussion of Respondent Demographics.....	69
3.4.3 Interpreting Perceptions of Technological Innovation at CPA Bank.....	71
3.4.4 Interpreting Perceptions of Operational Efficiency Dimensions	72
3.4.5 Interpreting Perceptions of Barriers to Technological Adoption	77
3.4.6 Discussion of Hypothesis Testing Results	79
3.4.7 Interpreting Findings through Theoretical Lenses (TAM, DOI, RBV)	88
CHAPTER 4: CONCLUSION.....	93
4.1 Introduction	94
4.2 Summary of Study Findings.....	94
4.2.1 Overall Impact of Technological Innovation on Efficiency (H ₀₁):.....	94
4.2.2 Impact of Technological Innovation on Specific Efficiency Dimensions:	95
4.2.3 Impact of Barriers to Technological Adoption on Overall Efficiency (H ₀₂):.....	96
4.2.4 Employee Perceptions and Qualitative Insights:.....	97
4.2.5 Theoretical Underpinnings:.....	98
4.3 Practical Implications.....	98

CHAPTER ONE: GENERAL INTRODUCTION

1.1 Background of the Study

The global banking sector has experienced a significant transformation, largely driven by technological innovation. This process began in the 1980s with the introduction of online banking and widespread credit card networks, leading to a rapidly evolving financial landscape. By the end of the 1990s, internet-based financial services and electronic funds transfer systems had become firmly established in many economies. The early 21st century saw the extensive adoption of smartphones and mobile applications, which further changed how financial services were accessed and used. At the same time, new technologies such as blockchain and peer-to-peer payment networks started to challenge conventional banking models. Kou and Lu (2025) observe that Financial Technology (FinTech), generally defined as "the application of technology to the delivery of financial services," did not appear suddenly but is instead the result of decades of gradual and significant innovations. Indeed, as Osei et al. (2023) note, the precursors of digital banking can be found in the introduction of Automated Teller Machines (ATMs) and electronic cards in the 1960s. By the 2020s, the financial services industry has become a leading adopter of digitalization globally, indicating a major shift where traditional physical branches are increasingly supported, and in some instances replaced, by online and mobile service delivery channels.

While the path of banking technology adoption has differed among nations, developing economies have shown a notable quickness in embracing many innovations. Digital finance, in particular, is widely seen as a crucial factor for improving operational efficiency, transparency, and competitiveness within the banking sectors of these countries. The introduction of new and cost-effective banking services, including online account creation, mobile money platforms, and digital lending solutions—is viewed as a way to reduce transaction costs and expand financial reach. The rapid adoption of various innovations in these economies might reflect an eagerness to modernize or meet immediate customer demands; however, this swift uptake of new tools does not always translate into deep, systemic improvements in efficiency. There can be a gap between adopting new technologies and fundamentally transforming the underlying operational processes, suggesting that the "quickness" might be more focused on specific, often visible, technologies rather than a comprehensive overhaul of the entire banking system.

Within Algeria, academic discussions similarly highlight the central role of technology in modernizing the banking industry. Benahmed et al. (2024), for example, report that "digital technology has made it possible to reduce costs and make the bank more profitable," further noting that Algeria's banking sector has experienced a "boom in digitalization" driven by the introduction of new payment systems and changing regulatory frameworks, including proposals for a state-backed digital currency. Ouahab and Koudjil (2024) agree, observing that the Algerian government is actively promoting the digitalization of financial services, considering it essential for broader economic development. In essence, the historical development of banking technology—from basic systems like ATMs and core banking software to modern FinTech innovations—provides the global context for examining bank productivity and serves as a relevant framework for evaluating the extent to which Algerian banks have utilized this transformative trend.

Efficiency in banking is generally understood as the skill with which a bank optimizes its outputs (services provided) in relation to its inputs (labor, capital, technology), or, alternatively, minimizes input use for a set level of output. Production efficiency within a banking institution can be broken down into technical efficiency (using the minimum amount of inputs to produce a given output level) and allocative efficiency (choosing the most cost-effective mix of inputs). As Evanoff and Israilevich (1991) explain, "allocative inefficiency occurs when inputs are combined in sub-optimal proportions," whereas "pure technical inefficiency occurs when more of each input is used than should be required to produce a given level of output". In practical terms, considerations of scale efficiency—whether a bank is operating at its most productive size—and scope efficiency—whether producing multiple services together yields cost advantages—are also very important. Consequently, a highly "efficient" bank would use an ideal combination of labor, capital, and technology, along with appropriate output levels, to minimize costs and maximize profitability.

The measurement of bank efficiency has advanced from simple financial ratios to complex econometric modeling techniques. Historically, regulators and industry professionals often relied on single ratios, such as the cost-to-income ratio or the efficiency ratio, which compare a bank's

operational expenses against its revenues. However, academic research has increasingly preferred frontier methodologies that can handle multiple inputs and outputs. Daley and Matthews (2009) observe a clear "preference for sophisticated techniques over simple accounting ratios" in current efficiency analysis.

Theoretically, technological innovation is expected to push a bank's production frontier outward, thereby allowing a higher output of services per unit of input. For instance, implementing automated processing systems, integrated core-banking software, or digital service channels can significantly reduce the labor needed per transaction. Digital platforms can enable increased operational scale, lower marginal costs, and simplify risk monitoring processes. Within such models, banks that adopt advanced technologies are expected to operate closer to the efficient frontier compared to their less technologically advanced peers.

Empirically, the banking literature generally shows a positive connection between technology investment and certain performance metrics. Zhong et al. (2021), in their analysis of Chinese rural banks, define staff, equipment, and IT expenditures as key inputs for measuring "innovation efficiency". In practice, many studies link indices of technology adoption or FinTech development with traditional efficiency scores or profitability measures. While some studies find that banks with greater digitalization benefit from lower operating expenses and higher profitability, others warn that the realization of such benefits may take time. The Jamaican study by Daley and Matthews (2009) demonstrates that advanced efficiency scores often differ from simple accounting ratios, highlighting that research-grade measures can capture performance with greater accuracy. Overall, although results may vary depending on the country context and methodological approach, the general agreement is that modern technology and digital channels are significant drivers of bank efficiency.

In summary, both theoretical frameworks and cross-country empirical evidence suggest a positive relationship: banks that effectively use technological innovations, such as online banking, advanced payment systems, and process automation, are expected to operate at lower costs and achieve greater scale, thereby improving measured efficiency. This provides a strong

reason for investigating this link specifically within the Algerian banking sector, where technology adoption paths and the competitive environment may differ from those in more extensively researched markets.

Despite the clear importance of technology for banking efficiency, there is a notable lack of empirical research on this specific topic in Algeria. Reviews of the FinTech and banking literature confirm that most studies focus on developed economies, with only limited representation of emerging markets. Osei et al. (2023) find that nearly all published works on digital banking transformation come from advanced countries, with "only China and India" prominent among large emerging economies and a virtual absence of studies from the African continent. Specifically within Algeria, academic literature has largely ignored formal efficiency analysis. Existing Algerian studies address certain aspects of banking technology and development—for example, Ouahab and Koudjil (2024) examine the challenges of financial digitization in Algeria, and Benahmed et al. (2024) discuss the opportunities from digital transformation—but none systematically evaluate how technological innovation specifically affects the efficiency of Algerian banks. This gap is particularly noticeable because, globally, the idea that technology drives banking efficiency is well-established, yet its applicability and manifestation in the unique Algerian context remain underexplored. This difference between global trends and local empirical evidence is a core reason for this study. The situation in Algeria points to a "known unknown": while global best practices are recognized, their specific effectiveness and how they play out in Algeria's distinct setting (with state-dominated banking and early-stage digital payment adoption) are largely assumed rather than empirically proven, making research in this area particularly valuable.

Simultaneously, analysts highlight significant technological gaps within the Algerian banking system. Government and industry reports indicate that the adoption of digital payments is still in its early stages (e.g., only a small percentage of the population uses mobile devices for online payments), and credit/debit card penetration is behind regional peers. Furthermore, the banking sector is mainly characterized by state-owned or closely regulated institutions, which, some observers argue, may have higher operational costs and less incentive for rapid

modernization. These factors together suggest that Algerian banks may not be operating at optimal efficiency levels, but without formal analysis, this remains an assumption.

Therefore, a clear difference exists between global best practices and local knowledge in Algeria. While theory predicts that digital banking innovations should improve efficiency, and studies in other countries have measured this effect, no peer-reviewed research has rigorously tested this idea for Algerian banks. Moreover, the distinctive structure of the Algerian banking sector (limited foreign bank presence, dominance of public banks) and its recent strong push towards digitization (shown by new legislation and payment infrastructure development) create a new and relevant context for such an investigation. This study is motivated by the need to address this knowledge gap—specifically, to empirically examine whether Algerian banks that adopt newer technologies, exemplified by *Crédit Populaire d’Algérie* (CPA), show higher operational efficiency, and to identify the specific factors that may help or hinder these potential gains.

Algerian banks face several obstacles that could potentially reduce efficiency improvements. Infrastructure is often cited as a key limitation. Ouahab and Koudjil (2024) note that Algeria's digitalization initiatives are hampered by "a lack of technological infrastructure, [and] lack of awareness among users". For instance, consumer trust in and familiarity with electronic payments are still developing, leading to continued reliance on cash-based transactions for many. Regulatory and institutional factors also present challenges. Samir and Koudjil (2024) emphasize that Algeria needs to invest in "infrastructure development, [and] improving legislation" to overcome digitization hurdles. While recent reforms, such as the 2023 Monetary and Banking Law¹, have introduced innovations like a planned central bank digital currency and strengthened supervisory frameworks, these legal changes must be supported by effective regulatory implementation and a supportive technological ecosystem before banks can achieve true efficiency gains.

This study will therefore pay close attention to technology adoption patterns and their

¹ Algeria's 2023 Monetary and Banking Law represents a key legislative overhaul aimed at modernizing the nation's financial system, notably by creating frameworks for digital banking and Islamic finance.

efficiency outcomes. By bridging the global literature on banking technology with the specific institutional context of Algeria, this research aims to provide a more complete understanding of whether—and how—technological innovation can improve the efficiency of Algerian banks, with a specific focus on Crédit Populaire d'Algérie (CPA). Addressing this knowledge gap is critical for policymakers and bank managers who aim to modernize the financial sector and enhance its contribution to Algeria's economic development.

1.1.1 Banking Industry in Algeria

Following its independence in 1962, Algeria nationalized most foreign and private banking institutions. The Banque d'Algérie² was established as the central bank, and the banking sector was merged into a few state-owned entities primarily focused on carrying out state-directed credit programs. However, throughout the 1990s and 2000s, several local private banks and joint-venture foreign banks were licensed under established regulatory criteria. More recently, the government has supported Islamic banking and encouraged private sector entry into the banking industry. Analysts from the International Monetary Fund (IMF) note that the new Monetary and Banking Law, adopted in 2023, explicitly accommodates digital and Islamic banking and aims to modernize the governance of the central bank.

Currently, the Algerian banking sector shows a dual nature. A small number of large, state-owned commercial banks (e.g., Banque Nationale d'Algérie, Banque de Développement Local, Crédit Populaire d'Algérie, CNEP Banque, Banque Extérieure d'Algérie³) continue to hold most banking assets and provide the majority of credit. A larger group of smaller private banks—both domestically owned and foreign-affiliated, including newly established Islamic banks—operate mainly in urban markets. According to the IMF (2024), Algeria's banking system as a whole is resilient, but "governance of state-owned banks" remains a point of concern, reflecting the

² The Banque d'Algérie is the central monetary authority of Algeria, responsible for issuing currency, regulating banks, implementing monetary policy, and overseeing the stability of the financial system.

³ These named institutions are the principal public sector banks in Algeria, historically forming the backbone of the country's financial system and continuing to dominate in terms of market share.

significant presence of public sector institutions in the financial landscape. This dominance of state-owned banks, while contributing to systemic stability, may inherently affect the pace and type of innovation compared to more competitively structured markets. The "dualistic nature" and the strong position of these state-owned banks create an underlying tension, as these established, potentially more bureaucratic institutions are now being driven by new legislation and market forces towards rapid digitalization. The central question is their capacity to adapt effectively. The recent legislative push towards digitalization creates a dynamic tension: can these large, traditional entities effectively adapt and use new legal allowances for innovation and efficiency? This question is central to understanding the context of a state-controlled bank like CPA. The predominance of these state entities might also act as a moderating factor, potentially slowing the pace and altering the nature of innovation relative to markets with more competitive structures. While this structure provides stability, it could also mean less aggressive adoption of cutting-edge, disruptive technologies unless mandated or strongly encouraged by the state.

Banks in Algeria are increasingly adopting financial technology, though from a relatively low starting point. In recent years, governmental authorities and the banking industry have launched several initiatives to digitalize banking services. The IMF (2023) explicitly recognizes that the authorities are implementing a broad digitalization strategy aimed at improving service delivery and governance. Under this strategic push, most commercial banks now offer online account access and have developed mobile banking applications (e.g., BaridiMobile by Algérie Poste, CPA-Mobile by Crédit Populaire d'Algérie). Thousands of ATMs and Point of Sale (POS) terminals have been deployed nationwide, and the use of electronic payment cards (CIB⁴ and international schemes like Mastercard/Visa) is growing. The government has also tested mobile wallet solutions ("e-Dinar") and QR-code payment systems to reduce reliance on cash. Importantly, the new banking law formally permits digital banking and new payment systems, aligning with IMF recommendations. However, overall adoption rates remain modest, with many customers still unbanked or hesitant to use online channels. The description of FinTech adoption as starting from a "relatively low baseline" signifies a considerable challenge in terms of the ground that needs to be covered, but it also presents a significant opportunity for rapid growth

⁴ CIB (Carte Interbancaire) refers to Algeria's domestic interbank card payment system.

and impact if adoption accelerates. Initial successful implementations of widely accepted technologies can show large percentage improvements and quick wins, even if the overall system lags behind global leaders, making even basic digital advancements highly impactful in this environment.

In summary, while Algeria's banking industry deals with long-standing legacy issues—such as state dominance, risk concentrations, and regulatory inflexibility—it also stands at a turning point. The introduction of new laws and digital strategies provides a framework for modernization. If governance structures can be reformed and operational efficiency improved, Algerian banks have the potential to drive the country's broader economic diversification and financial inclusion objectives.

1.1.2 Infrastructure Development

Algeria's technological environment has seen noticeable improvements over the last decade, providing a basic foundation for banking innovation; however, significant gaps remain. On the telecommunications side, the country has a largely modern mobile-broadband network. Major operators provide widespread 3G/4G coverage, with virtually all provinces served by cellular networks, and fiber-optic backbones connecting urban centers. As of early 2023, approximately 70% of Algerians were estimated to be Internet users, reflecting rapidly increasing usage rates. Indeed, the IMF notes that mobile phone ownership and Internet access are "widespread in Algeria and on par with other countries".

Nevertheless, fixed broadband penetration remains limited, and while data speeds and international bandwidth are growing, they still fall behind those of more advanced economies. More importantly, the use of this available infrastructure for banking purposes is still in an early phase. Mobile or online banking adoption rates are considerably lower than what connectivity levels might otherwise suggest. The IMF highlights that "the use of [mobile and internet] to perform financial transactions is well below average in Algeria" when compared to similar regions. For example, although nearly all citizens own a mobile device, only a small number use

it for digital payments or electronic transfers. Debit card usage and electronic payment penetration are relatively low: while the number of debit cards has increased, most Algerians continue to rely on cash or in-person branch visits for their transactions. In essence, digital literacy and trust in e-banking are still limited, and rural and lower-income populations often remain underbanked despite network coverage. This disparity between infrastructure availability and its application in financial services highlights that the challenges are not solely infrastructural but also include behavioral, regulatory, and trust-related factors, which are relevant to this study's investigation of barriers to technological adoption.

The regulatory framework is only just beginning to adapt to these technological realities. For many years, Algerian law reserved most payment services exclusively for banks, and no non-bank "e-money" or mobile-money licenses were issued. Recent reforms have aimed to bring about change. Algeria's new Monetary and Banking Law explicitly aims to modernize the financial system, strengthen oversight mechanisms, and promote financial inclusion. The IMF reports that the authorities plan to introduce new regulations for "online payment providers" and digital banking. For instance, a September 2023 central bank decree established rules for licensing foreign-exchange bureaus to offer certain services, partly to expand financial outreach. More broadly, FinTech is now explicitly mentioned in policy documents, and upcoming legislation is expected to cover digital wallets and payment system interoperability. In summary, while specific technical regulations are still developing, the trend is towards a more supportive FinTech environment. The historical legal reservation of payment services for banks and the slow emergence of non-bank e-money licenses suggest that the regulatory framework has, in the past, acted as a bottleneck, potentially stifling innovation from FinTechs or non-traditional players that could have spurred faster adoption. Recent reforms are an attempt to address this lag.

Algeria's technological infrastructure can be judged as partially adequate but with clear shortcomings concerning digital banking. The telecommunications backbone is strong, with widespread mobile and internet coverage, suggesting the capacity to support innovation. The IMF staff report explicitly notes the disparity: Algeria's connectivity indicators are "on par" with peers, yet digital finance use is well below regional norms. This implies that available infrastructure is

not being fully utilized. For banking efficiency, this means that future gains will depend on better applications and regulations: expanding interoperable payment rails, improving digital literacy, and encouraging the adoption of smartphone banking applications. Until then, efficiency gains from technological innovation will likely be limited by these adoption gaps. Nonetheless, planned reforms and the ongoing rollout of 4G/5G and fiber optic networks suggest that the country is moving towards addressing these shortcomings.

1.1.3 Overview of CPA Bank

Crédit Populaire d'Algérie (CPA) is a state-controlled bank established by ordinance No. 66-366 on December 29, 1966. Initially formed by merging several colonial-era popular banks. Its stated purpose has been to promote key economic sectors such as construction, public works, agriculture, health, commerce, and tourism, and to serve both retail and corporate customers. The Algerian government remains the majority shareholder, with the bank's capital reaching DZD 200 billion by the end of 2024.

According to CPA's official website and public documents, the bank has one of the largest branch networks in Algeria, reflecting its status as a major public bank. As of the end of 2024, CPA operated approximately 165 domestic branches, supported by 22 "digital spaces"⁵ and 108 Islamic-finance counters⁶ across the country. This extensive coverage represents roughly 10% of the national banking network. Such reach highlights CPA's strong market presence, particularly outside the capital city of Algiers. Recent corporate filings indicate that CPA ranks third among Algerian banks by most metrics: at the end of 2022, it held the third-largest market share of loans (approximately 14.8%) and deposits (approximately 13.4%) in the banking system. Its national ranking is also reflected in its profit figures: in 2022, CPA's net banking income and net profit each represented about 13% of the country's banking sector total. These figures illustrate CPA's

⁵ Digital spaces' refer to standalone kiosks equipped with self-service technologies.

⁶ 'Islamic-finance counters' offer products and services compliant with Sharia principles.

solid financial performance and stability.

CPA's service portfolio is broadly varied across different customer segments. It offers comprehensive commercial banking services to individuals (retail banking), small and medium enterprises (SMEs), and large corporates. Conventional products include savings accounts, term deposits, housing and consumer loans, commercial credit facilities, leasing, and trade-finance instruments. The bank also provides insurance products sold through branches (bancassurance), credit card and ATM services, and a variety of e-banking services. In recent years, CPA has introduced advanced payment and financing innovations—for example, a payroll financing card ("Cpaye+") and a non-interest-bearing savings account ("Idikhari")—targeting salaried workers and other specific segments. This diversification into Islamic finance and niche products suggests a strategy to cater to diverse customer needs and potentially tap into underserved market segments, using product innovation alongside technological innovation. While many of its core products are standard offerings, CPA's large customer base, comprising several million depositors and borrowers, covers all economic sectors.

Regarding technology, CPA has been actively modernizing its delivery channels. The bank operates a full-service Internet banking platform and a mobile application ("Mobile CPA") that allows customers to view account balances, transaction history, and initiate domestic transfers via smartphone on a 24/7 basis. CPA has invested in standard banking IT infrastructure, including core banking systems, payment processing capabilities, and ATM/POS networks, and participates in the country's interbank clearing systems. It has also introduced mobile-payment partnerships: for instance, CPA supports the Wimpay QR-payment service through collaboration with a telecom operator. Regulatory filings note a specific effort to "launch new distance payment offerings" and to "strengthen internet-based transfers". CPA's extensive physical branch network represents a traditional strength, and its simultaneous investment in digital channels shows an attempt to balance this traditional reach with modern service delivery.

As a large, state-controlled bank actively engaging in digital innovation, CPA serves as an excellent case study for exploring the broader challenges and opportunities related to

technological adoption and efficiency improvements within the dominant state-owned segment of the Algerian banking sector. Its efforts to modernize reflect the wider trends and governmental push for digitalization in the country, making its successes and failures potentially indicative of systemic issues.

1.2 Problem Statement

While global research consistently shows a positive link between technological innovation and bank efficiency, empirical evidence specific to the Algerian banking sector, particularly concerning *Crédit Populaire d'Algérie (CPA)*, remains limited. Existing studies, such as that by Meziane and Bouguetaia (2023), explore the broad impact of financial technology on the performance of Algerian banks but do not specifically address how digital banking technologies influence crucial operational efficiency metrics, such as resource utilization, transaction speeds, employee productivity, service quality and customer experience, within the unique limitations of Algeria's predominantly cash-centered economy and its underdeveloped digital infrastructure. The specific nature of this gap is critical; it is not merely a general lack of research, but a lack of understanding of how specific operational efficiency metrics are affected by technology within the particular context of a major Algerian state-owned bank like CPA,

This study aims to fill this identified gap by examining the effects of CPA's technological innovations (e.g., digital payment systems, remote banking platforms, mobile applications) on these precise efficiency dimensions. The investigation uses a multi-perspective approach, including operational insights from the Relizane branch, representing a ground-level view of technology implementation and use, and strategic perspectives from the Directorate of Marketing and Communication (DMC), offering a bank-wide outlook.

1.3 Objectives of the Study

General Objective:

To assess the impact of technological innovations on the operational efficiency of Crédit Populaire d'Algérie (CPA), incorporating perspectives from both branch-level operations (Relizane branch) and a central strategic unit (Directorate of Marketing and Communication).

Specific Objectives:

1. To assess the effect of technological innovations on CPA's resource utilization efficiency
2. To assess the effect of technological innovations (automated clearing, mobile and online channels, ATMs) on CPA's transaction processing speed
3. To assess the effect of technological innovations on employee productivity at CPA
4. To assess the effect of technological innovations on service quality and customer experience at CPA
5. To identify and evaluate the perceived impact of barriers (e.g., technical infrastructure, regulatory frameworks, internal organizational factors, cultural preferences) on the effective adoption and translation of technology investments into efficiency gains at CPA.

1.4 Research Questions

Main Research Question:

Does technological innovation (digital payment systems, remote banking platforms, mobile applications, electronic banking services, and automated systems) significantly affect the overall efficiency of Crédit Populaire d'Algérie (CPA), as perceived by employees of both the Relizane branch and the Directorate of Marketing & Communication?

Sub-Research Questions:

1. Does technological innovation significantly enhance resource utilization at CPA Bank?
2. Does technological innovation significantly improve transaction processing speed at CPA Bank?
3. Does technological innovation significantly enhance employee productivity at CPA Bank?
4. Does technological innovation significantly improve service quality and customer experience at CPA Bank?
5. What are the key perceived barriers to technological adoption at CPA, and how significant is their perceived impact on the bank's overall efficiency?

1.5 Hypotheses

Main Hypotheses

H₀₁: Technological innovation has no significant effect on the overall efficiency of Crédit Populaire d'Algérie (CPA)

H₀₂: Barriers to Technological Adoption have no significant effect on the overall efficiency of Crédit Populaire d'Algérie (CPA)

Sub-Hypotheses

H_{0a}: Technological innovation has no significant effect on resource utilization efficiency at CPA Bank

H_{0b}: Technological innovation has no significant effect on transaction processing speed at CPA Bank

H_{0c}: Technological innovation has no significant effect on employee productivity at CPA Bank

H_{0d}: Technological innovation has no significant effect on service quality at CPA Bank

1.6 Significance of the Study

This research offers several contributions to academia, banking practice, and policymaking.

- **Academic Significance:**

The study adds to the limited empirical literature on the connection between technological innovation and banking efficiency within the Algerian context. It provides a detailed, context-specific case study of a major state-owned bank, Crédit Populaire d'Algérie,

- **Practical Significance:**

For Crédit Populaire d'Algérie, this research provides actionable insights to optimize its ongoing digital transformation strategy, particularly relevant following its 2024 stock market debut.¹ The findings can help CPA identify areas where technological investments are producing the most significant efficiency gains (e.g., potentially in service quality) and areas where the conversion of technology into internal operational improvements may be lagging.

- **Policy Significance:**

The study's findings offer valuable information for Algerian policymakers and regulatory authorities. Insights into the perceived impact of technical infrastructure, regulatory frameworks, and other environmental factors on bank efficiency can guide policy adjustments aimed at creating a more supportive environment for digital finance

1.7 Scope and Limitations of the Study

- **Scope:**

This study focuses on Crédit Populaire d'Algérie (CPA) as a case study, examining the period from 2021 to 2024. The research primarily uses perceptions of employees from two distinct units within CPA: the Relizane branch (representing an operational perspective) and the Directorate of Marketing and Communication (representing a strategic, bank-wide perspective). Data are drawn from a questionnaire survey administered to these employees, a structured interview with the Relizane Branch Director, and publicly available financial and performance documentation from CPA and the Bank of Algeria. The study investigates the impact of technological innovation on four key dimensions of perceived operational efficiency: resource utilization, transaction

processing speed, employee productivity, and service quality/customer experience. It also assesses the perceived impact of various barriers to technological adoption on the bank's overall efficiency.

- **Limitations:**

The findings of this study should be considered in light of the following limitations:

- **Case Study Design:** The research is centered on a single bank, CPA. Consequently, the findings, while in-depth for this specific institution, may not be directly generalizable to other banks in Algeria, particularly private sector banks or smaller financial institutions that may operate under different strategic imperatives, resource constraints, or organizational cultures. This clearly acknowledges the trade-off between depth of understanding for CPA and breadth of generalizability.
- **Sample Characteristics:** The study sample comprises 34 employees drawn from two specific units within CPA. While providing valuable perspectives from operational and strategic levels, these views may not fully capture the diversity of experiences and opinions across all of CPA's departments, hierarchical levels, or geographical locations. The relatively small sample size, though deemed adequate for the surveyed units and yielding some statistically significant results, may limit the statistical power for other analyses and the broader generalizability of quantitative findings.
- **Cross-Sectional Data:** The primary survey data were collected at a single point in time. This cross-sectional approach provides a snapshot of perceptions and relationships as they existed during the data collection period. It limits the ability to definitively establish causality or to track the dynamic evolution of technology's impact on efficiency dimensions over an extended timeframe. Lag effects of technological investments, for example, cannot be fully captured.

1.8 Organization of the Study

This thesis is structured into four main chapters, designed to logically present the research from its conceptualization to its conclusions:

- Chapter 1: General Introduction: This chapter establishes the research context

- Chapter 2: Literature Review and Previous Studies: This chapter explores the existing body of knowledge relevant to the research topic. It examines key theoretical frameworks and reviews empirical findings from previous studies, thereby identifying the specific knowledge gaps that this research aims to address.
- Chapter 3: Empirical Study and Data Analysis: This chapter details the methodological approach used in the study then presents the empirical findings.
- Chapter 4: Conclusion and Recommendations: This final chapter summarizes the entire research effort, discusses practical implications of these findings for CPA, the broader Algerian banking sector, and national policymakers, and revisits the limitations of the study and proposes directions for future research.

CHAPTER TWO: LITERATURE REVIEW AND PREVIOUS STUDIES

2.1 Introduction

This chapter examines the theoretical frameworks and empirical studies that underpin the relationship between technological innovation and bank efficiency. It focuses on technological innovation, efficiency metrics, and contextualizes these within global, and regional research. The review aims to establish a foundation for analyzing CPA's operational efficiency in the Algerian banking landscape and identify the knowledge gaps this study seeks to address.

2.2 Theoretical Frameworks

The study of technological innovation in banking requires a robust theoretical foundation to understand the complex dynamics of technology adoption, diffusion, and its impact on organizational efficiency. This section presents and analyzes three principal theoretical frameworks relevant to understanding technological innovation in banking contexts: the Technology Acceptance Model (TAM), Diffusion of Innovation Theory, and the Resource-Based View (RBV). These frameworks offer complementary perspectives on how technological innovations are adopted, spread through organizations, and contribute to competitive advantage.

2.2.1 Technology Acceptance Model (TAM)

The Technology Acceptance Model, originally developed by Davis (1989), provides a theoretical basis for explaining user acceptance of information systems. The model proposes that actual system use is determined by behavioral intention to use, which in turn is influenced by two primary factors: perceived usefulness (PU) and perceived ease of use (PEOU).

Davis (1989, p. 320) defines perceived usefulness as "the degree to which a person believes that using a particular system would enhance his or her job performance," while perceived ease of use refers to "the degree to which a person believes that using a particular system would be free of

effort." These constructs form the foundation of TAM and have been extensively validated across various technological contexts.

The model posits that perceived ease of use has both a direct effect on intention to use and an indirect effect through perceived usefulness. This relationship acknowledges that technologies perceived as easier to use are more likely to be accepted, both directly and because they are perceived as more useful.

2.2.1.1 Application to Banking Contexts

The Technology Acceptance Model has been widely applied to banking technology adoption studies. Al-Somali et al. (2009) applied TAM to investigate internet banking acceptance in Saudi Arabia, finding that quality of internet connection, awareness of services, and trust significantly influenced perceived usefulness and perceived ease of use.

In the context of developing economies, Aderonke and Charles (2010) applied TAM to examine factors influencing the adoption of automated teller machines (ATMs) in Nigeria. Their findings confirmed the relevance of perceived usefulness and perceived ease of use but highlighted the need to consider additional contextual factors such as security concerns and technological infrastructure.

Despite its widespread application, TAM has faced critiques particularly relevant to institutional-level technology adoption. Bagozzi (2007) argues that TAM is too simplistic and fails to account for the social and collective aspects of technology adoption decisions, which are particularly pertinent in organizational contexts. Similarly, Legris et al. (2003) suggest that TAM explains only about 40% of system use, indicating the need to incorporate additional factors. Significantly for banking contexts in developing economies, TAM was originally developed for individual-level technology acceptance and may not fully capture the complexity of organizational-level adoption decisions (Oliveira & Martins, 2011). Banks operate within complex regulatory

environments and have distinct organizational structures that may influence technological innovation in ways not fully captured by the model.

2.2.2 Diffusion of Innovation (DOI) Theory

Diffusion of Innovation (DOI) Theory, introduced by Everett Rogers (1962, and later refined in 1995, 2003), provides a comprehensive framework for understanding the process by which new ideas, practices, or objects—innovations—spread through social systems over time. Rogers (2003, p. 5) defines diffusion as "the process by which an innovation is communicated through certain channels over time among the members of a social system".

A key aspect of DOI theory is the classification of adopters into five categories based on their degree of innovativeness, or their relative earliness in adopting innovations. These categories, when plotted over time, typically form a normal distribution:

- **Innovators (2.5%):** Adventurous individuals or organizations, eager to try new ideas, often risk-takers.
- **Early Adopters (13.5%):** Respected opinion leaders, more integrated into the social system, serve as role models.
- **Early Majority (34%):** Deliberate individuals or organizations who adopt new ideas just before the average member; they are important in making an innovation legitimate.
- **Late Majority (34%):** Skeptical individuals or organizations who adopt new ideas just after the average member, often in response to social pressure or economic necessity.
- **Laggards (16%):** Traditional individuals or organizations, last to adopt an innovation, often suspicious of change.

Rogers (2003) further identifies five key perceived characteristics of an innovation that significantly influence its rate of adoption:

- **Relative Advantage:** The degree to which an innovation is perceived as being better than the idea, product, or practice it replaces.
- **Compatibility:** The degree to which an innovation is perceived as consistent with existing values, past experiences, beliefs, and needs of potential adopters.

- **Complexity:** The degree to which an innovation is perceived as difficult to understand, learn, or use.
- **Trialability:** The degree to which an innovation may be tested on a limited basis before a full adoption commitment is required.
- **Observability:** The degree to which the results or benefits of an innovation are visible and can be communicated to others. Innovations that are perceived as having greater relative advantage, compatibility, trialability, and observability, and less complexity, will generally be adopted more rapidly.

2.2.2.1 Application to Banking Contexts

The adoption process in DOI theory consists of five stages: knowledge, persuasion, decision, implementation, and confirmation. In banking contexts, this process takes on unique characteristics due to the regulated nature of the industry and the criticality of financial services.

For example, Wejnert (2002) emphasizes that the characteristics of innovators (in this case, banks) significantly influence the diffusion process. Larger banks with greater resources may function as early adopters, while smaller institutions may adopt later after innovations have been tested and proven. This pattern has been observed in the diffusion of internet banking services (Courchane et al., 2002).

Rogers (2003) identifies several organizational characteristics that influence innovation adoption, including size, complexity, formalization, interconnectedness, organizational slack, and leadership attitude toward change. These factors are particularly relevant to understanding technological innovation in banking institutions.

Frambach and Schillewaert (2002) extend these concepts, suggesting that organizational adoption decisions are influenced by the perceived characteristics of the innovation, characteristics of the adopting organization, environmental influences, and supplier marketing efforts. In banking contexts, regulatory compliance requirements add another critical dimension to diffusion patterns.

Empirical research by Liang et al. (2007) demonstrates that institutional pressures significantly influence organizational innovation adoption decisions, particularly in highly regulated industries like banking. This finding is particularly relevant to understanding innovation diffusion in the Algerian banking sector, where institutions operate under both central bank oversight and competitive market pressures.

2.2.3 Resource-Based View (RBV)

The Resource-Based View (RBV) of the firm, articulated by Barney (1991) and extended by various scholars, proposes that firms can achieve sustainable competitive advantage through the strategic management of resources and capabilities. According to Barney (1991, p. 101), resources include "all assets, capabilities, organizational processes, firm attributes, information, knowledge, etc. controlled by a firm that enable the firm to conceive of and implement strategies that improve its efficiency and effectiveness. The core premise of RBV is that competitive advantage derives from resources that are Valuable, Rare, Imperfectly imitable, and Non-substitutable (VRIN). Resources meeting these criteria enable firms to implement strategies that competitors cannot easily duplicate, leading to sustainable competitive advantage.

While the original RBV framework focused on static resources, Teece et al. (1997) extended it to include dynamic capabilities, defined as "the firm's ability to integrate, build, and reconfigure internal and external competencies to address rapidly changing environments" (p. 516). This extension is particularly relevant to technological innovation in banking, given the rapidly evolving nature of financial technologies.

Dynamic capabilities are especially relevant to understanding how banks adapt to technological changes, as they explain the mechanisms through which organizations "purposefully create, extend, or modify [their] resource base" (Helfat et al., 2007, p. 4). This perspective helps

explain how banks develop the capacity to continuously innovate and adapt to changing technological landscapes.

2.2.3.1 Application to Banking Contexts

The RBV framework has been applied extensively to understand competitive advantage in banking contexts. Furst et al. (2002) found that banks with superior technological resources and capabilities were better positioned to offer innovative services and achieve operational efficiencies, leading to competitive advantage. Ray et al. (2005) demonstrate that technological resources alone are insufficient for competitive advantage; rather, it is the combination of technological resources with complementary organizational capabilities that leads to superior performance. In banking contexts, this suggests that technological innovations must be integrated with appropriate organizational structures, processes, and human capital to yield efficiency gains.

Lin (2007) specifically applies RBV to understand the relationship between information technology resources and bank performance, finding that IT resources contribute to competitive advantage primarily through their complementarity with other organizational resources and capabilities.

From an RBV perspective, technological innovations in banking can constitute strategic assets when they meet the VRIN criteria. For example, proprietary banking platforms that improve operational efficiency while being difficult to imitate can provide sustainable competitive advantage (Zhu & Kraemer, 2005). Huang et al. (2006) further demonstrate that information technology assets contribute to bank performance through both direct effects on efficiency and indirect effects through capability enhancement. This dual pathway suggests that technological innovations can drive bank efficiency through multiple mechanisms.

Despite its theoretical appeal, applying RBV empirically presents significant measurement challenges. Intangible resources and capabilities, such as technological knowledge and innovation capacity, are inherently difficult to measure (Godfrey & Hill, 1995).

Empirical applications in banking literature have addressed these challenges through various approaches. Zhu (2004) uses a process-oriented approach to measure IT capability and its impact on bank performance, focusing on specific technological capabilities rather than general IT resources.

2.3 Empirical Literature Review

2.3.1 Technological Innovation in Banking

Innovation, in a general sense, has been defined in numerous ways, but most definitions agree on the idea of introducing or commercially using new ideas, products, processes, or organizational forms. For example, innovation has been described as the successful exploitation of new ideas and as "a continuous and dynamic process in which ideas are transformed into value" (Confederation of British Industry, 2008). In traditional economic terms, Joseph Schumpeter (1934) viewed innovation as "the creation of new combinations of factors of production, leading to new products, new production processes, the opening of new markets, the exploitation of new sources of supply, or new organizational structures".

Within the specific area of banking, technological innovation refers to the application of these new ideas and inventions to the financial services context. This involves using digital or computer-based technology to deliver banking products more effectively, improve internal processes, or create entirely new service offerings.

In essence, technological innovation in banking means the introduction of new technical solutions or methods—not previously available or widely used—into banking operations, products, or delivery channels, with the objective of enhancing performance, creating new value for customers, or improving efficiency.

Importantly, technology adoption in banking has been an ongoing process for many decades. As the Basel Committee on Banking Supervision observes, "Innovation in banking is not new and banks started introducing online services well before fintech-based firms were entering the market". Indeed, early studies in the field found that banks which were pioneers in adopting online banking and other technologies tended to be more profitable than their slower-adopting counterparts, suggesting that "technology adopters seem to be more profitable" than laggards. This historical trend demonstrates that innovation has long been a key part of banking strategy, not merely a recent development driven by the rise of FinTech startups. This perspective frames current FinTech trends as part of a longer evolutionary process, adding depth to the understanding of the current wave of digitalization.

Over time, scholars and practitioners have classified banking innovations into distinct types, often reflecting the classifications used in broader innovation management literature. A common and useful classification distinguishes between product innovation, process innovation, and organizational innovation:

- **Product (or Service) Innovation:** This refers to launching new or significantly improved banking offerings made available to customers. Examples include a new type of loan product with flexible terms, a mobile payment application with enhanced features.
- **Process Innovation:** This involves implementing new or significantly improved ways of carrying out internal banking operations or delivering services to customers. In banking, this means adopting better internal workflows or customer-facing processes. For instance, automating loan approval processes, using software to handle repetitive back-office tasks, implementing electronic check clearing systems. Formally, process innovation is the adoption of improved or new modes/methods of production or service operations, typically aimed at achieving efficiency gains, reducing costs, or improving service speed and quality.

Organizational Innovation (sometimes termed managerial or administrative innovation): This type of innovation involves adopting new organizational structures, management practices, or business models. This can include changes in how the bank is organized internally, how it manages its human resources, or how it interacts with external partners and the

broader market. Examples in banking could include creating a new, flexible digital subsidiary, forming strategic partnerships or joint ventures with FinTech startups. Organizational innovations in banking might also include new marketing methods or customer relationship management strategies.

Table 2.1 Types of Technological Innovation in Banking

Table 2.1 provides a clear, concise, and structured overview of these different types of technological innovation in banking, aiding in conceptual clarity.

Type of Innovation	Definition	Banking Examples
Product innovation	Introduction of new or substantially improved banking products or services (customer-driven)	Mobile banking apps, contactless payment cards, robo-advisors, new loan/credit products
Process innovation	Implementation of new or enhanced processes or methods for delivering banking services (efficiency-driven)	Automated teller machines (ATMs), online account opening, AI credit scoring
Organizational innovation	Adoption of new organizational structures, business models or management methods in banking (e.g. new work practices, partnerships)	Branchless banking models, bank-fintech alliances

Source: Synthesized by the student based on relevant literature

In banking strategy, technological innovation is critically important. It can improve operational efficiency and reduce costs, support better customer service, and create competitive advantage. As noted, early adopters of banking technology tended to achieve higher profitability. By contrast, banks that fail to innovate risk falling behind agile fintech competitors or losing market share. Furthermore, regulators and investors increasingly expect banks to modernize their infrastructure for safety and stability. In sum, technology is now central to banking strategy: banks

that innovate can enhance efficiency, expand into new markets (e.g. via digital channels), and meet evolving customer demands, while those that do not may see declining performance.

2.3.2 Bank Efficiency

Bank efficiency, in broad terms, refers to how effectively a bank uses its available resources—such as capital, labor, technology, and physical assets—to achieve its stated objectives, which typically include generating revenue, delivering a range of financial services, or maximizing profitability. In economic terms, efficiency means maximizing outputs for a given set of inputs, or, similarly, minimizing the inputs (and thus costs) required to produce a given level of outputs. In banking research, efficiency is often examined through the perspectives of cost efficiency (minimizing operating costs relative to the outputs produced) and profit efficiency (maximizing profits given market prices for inputs and outputs). Surveys of the banking literature consistently note that different measurement methods and definitions of inputs and outputs can produce varying efficiency estimates, reflecting the inherent complexity of the concept. While simple measures like the cost-to-income ratio⁷ are often used in practice, these typically capture only a single dimension of a bank's overall efficiency.

Bank efficiency is inherently a multi-dimensional concept. Academics and practitioners alike recognize several distinct aspects. Cost efficiency, as mentioned, focuses on the bank's cost structure relative to the volume and type of services produced. Revenue or profit efficiency considers aspects such as pricing strategies, product mix optimization, and the ability to generate maximum revenue or profit from available resources and market opportunities. Scale efficiency addresses whether a bank is operating at an optimal size to minimize average costs, while scope efficiency relates to potential cost savings from producing multiple types of financial services jointly rather than separately. Furthermore, non-financial dimensions, such as service quality and the overall customer experience, have become increasingly linked to the concept of efficiency in modern banking: delivering better service with fewer errors, reduced delays, and enhanced

⁷ The cost-to-income ratio is a key financial metric used to assess a bank's operational efficiency; a lower ratio generally indicates better performance, as it means costs are a smaller proportion of income.

customer satisfaction, using resources carefully, is itself a form of efficiency gain. This inclusion of service quality and customer experience marks an evolution from purely cost-focused views to a more holistic concept of efficiency that incorporates customer value.

To clarify these dimensions, four specific efficiency metrics often cited in banking literature and relevant to this study are examined below and summarized in Table 2.2:

- **Resource Utilization Efficiency:** This metric measures how well a bank converts its various resources (inputs) into desired outputs or outcomes. It typically involves ratios that compare resources consumed to outputs generated. A common example is the **cost-to-income ratio**, defined as operating expenses divided by operating income
- **Employee Productivity:** This metric focuses specifically on labor efficiency and measures the output generated per employee. For example, banks often compute **revenue per employee** or the **number of transactions processed per employee** as indicators of workforce productivity. Higher employee productivity implies that each staff member is generating more business value (e.g., sales, transactions processed, customers served). Since labor is a major cost component for most banks, increasing output without a proportional increase in headcount directly boosts overall efficiency.
- **Transaction Processing Speed:** This measures the operational speed and output of banking processes. It includes how quickly a bank can complete standard transactions (such as withdrawals, deposits, transfers, bill payments) or more complex processes (like account opening or loan application processing). Faster processing generally means less time and effort are spent per transaction, which is a direct form of efficiency. Common measures might include the **average transaction completion time** or the **number of transactions processed per unit of time** (e.g., per hour). For instance, if an automated processing system can handle significantly more fund transfers per hour than a manual system, it clearly increases efficiency. In modern banking, transaction speed is critical, as slow services can lead to customer dissatisfaction and waste bank resources, whereas high speed often reflects streamlined, efficient underlying processes.
- **Service Quality and Customer Experience:** Traditionally, service quality might have been viewed as distinct from efficiency. However, in contemporary banking, these concepts are increasingly connected. Service quality measures assess dimensions such as reliability,

responsiveness, assurance and empathy. High service quality often requires efficient underlying processes and adequately trained and motivated employees. Conversely, investing in enhancing the customer experience (through user-friendly technology, improved branch services, or personalized interactions) can lead to increased customer loyalty, retention, and reduced costs associated with handling errors or complaints. Thus, customer experience metrics (such as **customer satisfaction scores**, **Net Promoter Score (NPS)**, or **service error rates**) are also considered integral to a broader understanding of overall efficiency: a bank that delivers high-quality service with minimal resource wastage is operating efficiently in a comprehensive sense.

Table 2.2 Comparative Metrics of Bank Efficiency:

This table defines these specific dimensions of bank efficiency, operationalizing the broad concept into measurable components

Efficiency Metric	Description	Example Measure/Indicator
Resource utilization efficiency	Ability to maximize outputs from resources, or minimize resources for given outputs.	Cost-to-income ratio (lower is better); operating expense ratio, efficient use of physical space
Employee productivity	Output per employee (reflecting labor efficiency).	Revenue per employee; number of accounts serviced per teller; loans processed per loan officer.
Transaction processing speed	Speed and throughput of transaction operations (reflecting process efficiency).	Average time to process a payment; transactions per second in ATM network; time to approve a loan application.
Service quality / customer experience	Quality of service delivery and customer satisfaction, reflecting efficient use of resources to meet customer needs.	Customer satisfaction index; frequency of service errors; latency in customer service response.

Source: Synthesized by the student based on relevant literature

Each of these metrics highlights a different aspect of a bank's efficiency. Resource utilization focuses on costs and assets, employee productivity on labor, processing speed on operations, and service quality and customer experience on customer outcomes. Taken together, they form a multi-faceted picture: for example, a bank might have low costs (good resource efficiency) but if it delivers poor service quality (dissatisfied customers), its overall efficiency is undermined. Thus, modern bank efficiency analysis must consider both quantitative outputs and qualitative experience.

2.3.3 Importance of Bank Efficiency

In today's fast-paced and highly competitive banking environment, operational efficiency is more critical than ever. Banks face intense competitive pressures not only from traditional rival institutions but also from FinTech entrants and non-bank players who are using technology to offer innovative and often lower-cost financial solutions. At the same time, tight regulatory constraints, including capital adequacy and liquidity requirements, impose significant compliance burdens and require careful resource management. In this environment, bank efficiency is not just an advantage but a fundamental requirement for survival and relevance.

Efficiency enables banks to invest in new technologies and services without incurring excessive expenditure, thereby fostering a positive cycle of innovation and improvement. This highlights a feedback loop where efficiency fuels further advancement. For customers, efficient banks can offer faster transaction processing, more convenient access to services and a quicker introduction of innovative products and services, such as mobile payments. Regulators also indirectly promote efficiency: by imposing strict capital and liquidity requirements, they effectively push banks to optimize their use of capital and manage their balance sheets more efficiently. Poor operational efficiency can expose a bank to increased financial stress, particularly during economic downturns, whereas a leaner, well-managed, and efficient bank is generally more resilient and better equipped to handle challenges.

2.3.4 The link between Technological Innovation and Bank Efficiency

The literature identifies several theoretical approaches that support the link between technological innovation and organizational performance, including bank efficiency. In classic economic theory, technological progress has long been recognized as a fundamental driver of productivity growth and efficiency improvements. For example, Solow (1957) treated technology as an external factor that raises output per unit of input, contributing to overall economic growth.

Empirical research in the banking sector generally supports the idea that technological innovation is associated with higher banking efficiency, although the specific results can vary depending on the context (e.g., country, type of bank), the measure of efficiency used, and the type of technology considered. Early studies, such as those by Berger et al. (2005) and De Young et al. (2007), found clear links between technological adoption and improvements in cost efficiency or profitability measures in banks.

More recent work has focused on the impact of specific types of innovations, particularly those related to FinTech and digital banking, across various regions. For example, Lee et al. (2021), examining Chinese banks over the period 2007–2018, found that banks with a higher degree of FinTech innovation showed significantly higher cost efficiency (a measure of resource utilization efficiency), as well as improvements in overall technology usage. Similarly, Manasseh et al. (2025) analyzed banks in the Economic Community of West African States (ECOWAS) from 1997–2022 and showed that both FinTech adoption and general innovation positively impact bank performance. They found that FinTech adoption and innovation "positively boost bank performance," implying higher profitability and efficiency, especially after accounting for the influence of the regulatory context. Notably, these authors emphasized the crucial role of supportive regulatory frameworks, arguing that regulated FinTech investment is key to realizing such performance gains. This reinforces the theme that regulation is a crucial enabling factor.

Evidence from developed markets presents a somewhat mixed picture at times. Liao (2023), in a study of Taiwanese banks, found only modest overall efficiency gains from FinTech initiatives. While noting that mobile payment systems improve bank efficiency in specific areas, the study concluded that overall FinTech initiatives did not significantly raise efficiency across the sample, leading to an apparent "IT productivity paradox". This paradox, where significant investments in IT do not always translate into immediate or proportional productivity gains, suggests that the relationship between technology and efficiency is not always straightforward and can be influenced by various mediating factors, such as implementation challenges, organizational resistance, or the time lags required for benefits to appear.

In emerging markets, smaller-scale studies often report positive effects. For instance, Zouari and Abdelhedi (2021), in their research on Tunisian banks, found that incorporating digitalization as a dimension of service quality significantly increased customer satisfaction, which, in turn, should support efficiency through mechanisms like improved customer retention and reduced customer turnover.

In sum, although methodologies differ across studies, the weight of recent research from various banking contexts suggests that technological innovation generally tends to improve bank performance metrics, especially those related to cost efficiency and productivity. However, the magnitude and timing of these benefits can depend significantly on factors such as the quality of implementation, the specific characteristics of the adopted technology, the prevailing economic and regulatory environment, and the particular efficiency metric being assessed. This highlights the "it depends" factor: context matters greatly, underscoring the need for context-specific studies like the current one on Algeria.

2.3.5 Technological Innovation and Efficiency Metrics

The impact of technological innovation can be examined more specifically in relation to the distinct dimensions of bank efficiency previously outlined:

- **Technological Innovation and Resource Utilization Efficiency:**

Resource utilization efficiency generally refers to how well a bank uses inputs (labor, capital) to produce outputs, often measured via cost or operational efficiency. Technology can improve this by automating processes, reducing redundancies, and enabling leaner operations. For example, digital credit scoring and online loan processing reduce manual workload on staff and shorten approval cycles, effectively doing more with the same inputs. In the Chinese study above, Lee et al. (2021) report that banks actively deploying fintech (mobile platforms, online services, etc.) achieved significantly better cost efficiency than peers, meaning lower costs per unit of output. They emphasize that fintech-driven efficiency gains occur through both back-office automation and new digital service channels. In short, the literature consistently finds that by enabling automated processing and digital channels, technological innovation raises resource efficiency in banking.

- **Technological Innovation and Employee Productivity**

Employee (or labor) productivity—typically measured as output per staff member—represents a direct channel through which technological innovation can boost overall bank efficiency. New technologies can relieve staff from performing repetitive, low-value tasks, thereby freeing up their time and mental capacity to focus on more complex, customer-facing, or value-added activities. Obeng and Boachie (2018) explicitly investigated this link in the Ghanaian banking sector. Their research showed that banks that "pursue technological innovation in order to improve the productivity of employees" indeed observe measurable gains. Their analysis indicated that process innovations, such as the implementation of computerized workflows and new IT tools for staff, had the largest positive effect on staff productivity, with some innovations reportedly improving productivity by a factor significantly greater than other influencing variables. This suggests that when banks introduce IT-driven process improvements, each employee can potentially handle a significantly larger volume of transactions, manage more customer relationships, or perform their tasks more effectively.

- **Technological Innovation and Transaction Processing Speed**

Another key efficiency dimension is the speed of banking processes – how quickly transactions can be completed. Technological innovations dramatically shorten processing times. For example, electronic funds transfer systems and real-time payments eliminate days of manual clearing. New payment fintech (mobile wallets, QR payments) allow near-instant transactions and 24/7 availability. While fewer academic studies quantify this explicitly, it is widely acknowledged that digital channels reduce wait times and queue lengths. For instance, the Taiwan study by Liao (2023) notes that initiatives like mobile payment systems help banks process transactions more rapidly, another study (Mbama et al., 2018) infer that faster service enabled by innovation is a driver of perceived efficiency and quality.

The link to efficiency is clear: speeding transactions allows higher throughput with the same resources. Thus, technological innovation is credited with raising processing speed, which in turn lowers time-related costs (labor hours per transaction) and improves customer throughput.

- **Technological Innovation and Service Quality and Customer Experience**

Finally, innovation affects non-financial performance dimensions like service quality and customer experience, which indirectly relate to efficiency by attracting more business. Digital banking technologies (mobile apps, online chat) have been shown to enhance service quality. For example, Zouari and Abdelhedi (2021) extend the analysis model for Islamic banking and find that adding a "digitalization" dimension significantly improves customer satisfaction. In their Tunisian sample, banks that offered more digital services saw higher service-quality ratings. This means customers could complete transactions faster and with fewer errors, a qualitative enhancement of efficiency. Good service quality can translate into efficiency by reducing rework and increasing customer retention, which spreads fixed costs over a larger base, Other studies similarly report that innovation (e.g. CRM systems) raises perceived service quality and reduces complaints (Boniphace et al., 2024). In sum, the literature confirms that service quality/customer experience improves when banks deploy innovative technologies and this contributes to overall bank efficiency

both directly through smoother service delivery and indirectly through higher revenue efficiency.

2.3.6 Previous Studies

A review of empirical studies highlights the varied yet generally positive impact of technological innovation on bank efficiency and performance across different global contexts. Table 2.3 summarizes key findings from selected relevant research, showcasing the diversity of methodologies used and reflecting the complexity of measuring innovation and efficiency.

Table 2.3: Summary of Key Empirical Findings from Previous Studies

Author(s) & Year	Study Purpose/Objectives	Methodology	Key Findings
Lee, C.-C., et al. (2021)	Examine whether fintech innovation improves bank efficiency in China's banking industry.	Stochastic metafrontier approach; 86 Chinese banks (2003–2017).	Fintech innovations improve cost efficiency and technology; market support services most significant.
Wang, Y., et al. (2021)	Assess impact of fintech on efficiency of commercial banks using big data.	Data Envelopment Analysis (DEA) for Total Factor Productivity (TFP); regression; data from commercial banks.	Fintech boosts TFP of commercial banks, with effects varying by technology adoption level.
Prakash, N., et al. (2021)	Analyze impact of IT investments on bank	Stochastic Frontier Analysis and DEA; data from 72 Indian	IT investments improve bank efficiency,

	efficiency in India and test Solow's paradox.	commercial banks (2008–2019).	invalidating Solow's paradox in India.
Enoruwa, O. K., et al. (2023)	Examine impact of technological innovations on bank performance in West Africa.	Multiple models; annual data from 1997–2020 for banks in Nigeria, Ghana, Ivory Coast.	Technological innovation has both positive and negative long-run relationships with bank performance.
Asare Yaw Obeng, & Emmanuel Boachie. (2018)	Explore impact of IT-technological innovation on productivity of banking employees in Ghana.	Logistic regression analysis; survey data from bank employees.	Innovation has significant positive effect on process improvement and employee productivity.
Meziane, M. T., & Bouguetaia, S. (2023)	Determine the impact of financial technology on the performance of banks in Algeria.	Panel data analysis of 15 Algerian banks from 2017 to 2021 using multiple linear regression (OLS method).	Financial technology positively impacts bank performance; specific results on credit card balances and technological assets affecting ROA and ROE.
Linn, S. (2020)	Determine the impact of technological innovation on banking in Myanmar, focusing on profitability, operational efficiency, and customer satisfaction and loyalty.	Mixed methods: survey of 205 bank customers and interviews with 8 senior managers from four banks in Myanmar.	Technological innovations positively impact profitability, operational efficiency, and customer satisfaction and loyalty.

Source: Compiled by the student from the cited studies

The reviewed studies, covering diverse global contexts from China and India to Algeria, collectively indicate that technological innovation, generally enhances bank efficiency and performance. However, the magnitude and nature of this impact can vary across different regions and are often influenced by factors such as resource management capabilities, the level of existing digital infrastructure, regulatory environments, and specific market characteristics.

Notably, the study by Meziane and Bouguetaia (2023) provides valuable insights into the positive impact of financial technology on overall bank performance in Algeria. This is the most directly relevant prior work concerning the Algerian context. This study serves as a stepping stone, with the current research positioned as a logical and necessary next step to build upon and deepen existing local research. Similarly, studies in comparable emerging markets, such as Linn (2020) in Myanmar highlighting benefits for profitability, operational efficiency, and customer satisfaction, lend further support to the potential for technology to drive positive outcomes in developing banking sectors.

Despite these contributions, a clear gap remains in the literature regarding the specific impact of recently adopted digital banking technologies on detailed operational efficiency metrics—namely resource utilization, transaction processing speeds, employee productivity, and customer experience/service quality—within the Algerian banking sector, and particularly for a major state-owned institution like *Crédit Populaire d’Algérie* (CPA). While the Meziane and Bouguetaia (2023) study addresses overall bank performance in Algeria, it does not explore the detailed operational efficiency aspects and their underlying mechanisms that are central to the current research. The current study seeks to extend their work by focusing on CPA specifically, examining these more detailed metrics, and incorporating qualitative perspectives to understand the nuances of technology implementation and impact.

Furthermore, the unique characteristics of the Algerian banking environment, including its historically cash-centered economy and, in some aspects, still-developing digital infrastructure, require a focused examination of how recent implementations of digital tools affect these specific efficiency metrics within CPA. This study aims to address this gap by investigating the influence

of banking technologies on CPA's operational efficiency, thereby contributing novel empirical evidence to the literature.

2.4 Conclusion of Literature Review And Previous Studies

The comprehensive review of existing literature strongly demonstrates that technological innovation, in its various forms, generally plays a significant role in enhancing bank efficiency across diverse economic and geographical contexts. Theoretical frameworks, including the Technology Acceptance Model (TAM), the Diffusion of Innovation (DOI) Theory, and the Resource-Based View (RBV), offer complementary perspectives through which the complex processes of technology adoption, diffusion, and strategic use influence operational performance and competitive positioning in the banking sector.

CHAPTER 3: EMPIRICAL STUDY AND DATA ANALYSIS

3.1 Introduction

This chapter presents the empirical study conducted to assess the impact of technological innovation on the operational efficiency of Crédit Populaire d'Algérie (CPA). The analysis draws upon insights gathered from employees at two distinct organizational levels within CPA: the Relizane Branch, representing an operational perspective, and the Directorate of Marketing and Communication, offering a bank-wide strategic viewpoint..

Building upon the theoretical frameworks and the review of existing literature detailed in Chapter 2, the main aim of this chapter is to provide both quantitative and interpretive insights into how technological advancements are perceived by CPA staff to affect various dimensions of operational efficiency within this specific Algerian banking context.

3.2 Research Methodology

The methodology employed in this study was designed to rigorously assess the impact of technological innovation on the operational efficiency of Crédit Populaire d'Algérie (CPA).

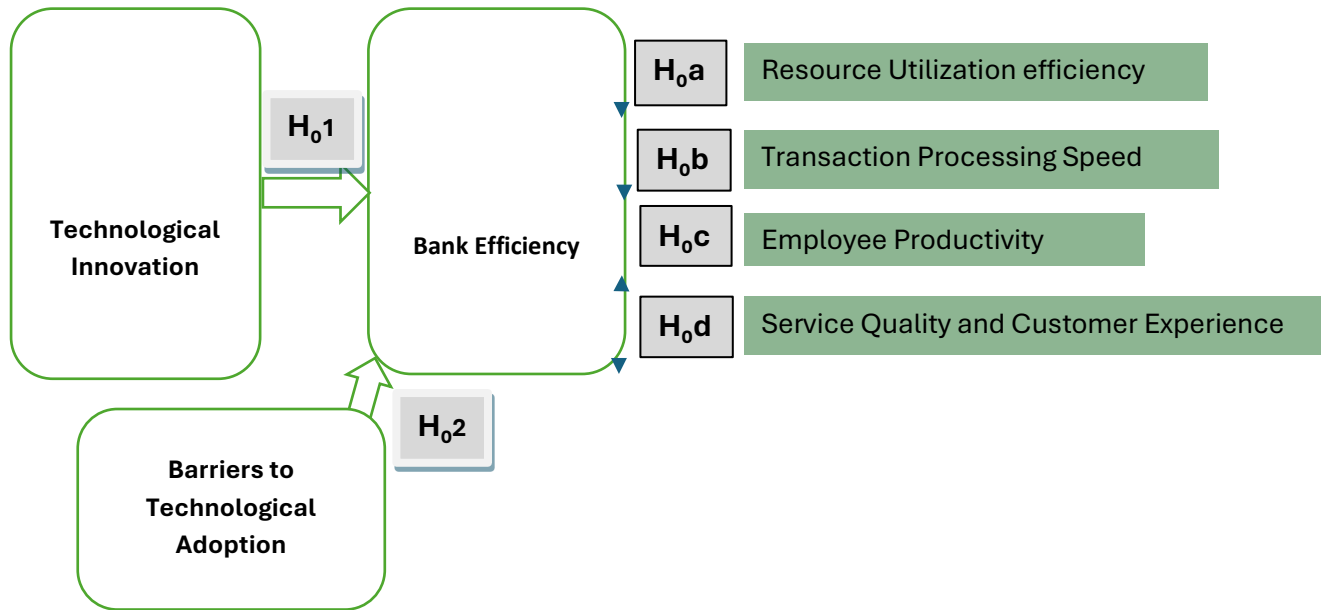
This section outlines the research design, study population and sampling procedures, data collection instrument, validity and reliability measures, and data analysis techniques.

3.2.1 Research Design

The research design is structured to objectively capture CPA employees' perceptions regarding both the benefits derived from technological innovations and the barriers that may hinder the full realization of such innovations. Furthermore, the design allows for an analysis of how these perceived factors relate to various dimensions of operational efficiency.

The conceptual framework guiding this research is illustrated in Figure 3.1. This figure provides an immediate visual representation of the study's theoretical model and the relationships being tested, clarifying the roles of variables and how hypotheses fit into the overall structure.

Figure 3.1: Conceptual Framework



Source: Prepared by the student

Figure 3.1 illustrates the hypothesized relationships. The primary independent variable is Technological Innovation, which refers to the adoption and implementation of new digital technologies, systems, and processes designed to enhance banking operations and service delivery. Additionally, the model incorporates Barriers to Technological Adoption as another independent factor. This construct captures potential obstacles—such as limitations in infrastructure, regulatory constraints, or cultural preferences for traditional banking methods—that might affect the bank’s ability to fully leverage technology for efficiency gains. The second main hypothesis (H₀2) specifically tests whether these perceived barriers have a significant impact on overall efficiency.

The dependent variable is Bank Efficiency, representing the bank's perceived ability to optimize its outputs (services, customer satisfaction) from its inputs (resources, technology). This is conceptualized through four key dimensions: (1) Resource Utilization Efficiency, reflecting the

optimal use of physical and digital resources; (2) Transaction Processing Efficiency, concerning the speed and accuracy of processing banking transactions; (3) Employee Productivity, relating to the output and effectiveness of bank staff; and (4) Service Quality and customer experience.

The model suggests that Technological Innovation potentially influences overall bank efficiency, as well as each of these four specific dimensions. This is examined through the main hypothesis H₀₁ and the four sub-hypotheses (H_{0a}, H_{0b}, H_{0c}, H_{0d}). This framework allows for a systematic analysis of how digital transformation is perceived to impact banking performance within the Algerian context, specifically at CPA.

This study employed a quantitative, descriptive-analytical research design. The primary approach was quantitative, using numerical data collected through a structured questionnaire to measure variables and analyze relationships statistically across the combined sample of employees from the CPA Relizane branch and the Directorate of Marketing and Communication. This approach is well-suited for objectively assessing the perceived impact of specific technological innovations on quantifiable aspects of bank efficiency. The design is also descriptive, as it aims to characterize the current state of technological adoption, perceived efficiency levels, and perceived barriers within these key units of CPA. Furthermore, it incorporates an analytical component by examining the statistical relationships between technological innovation variables and operational efficiency dimensions to test the research hypotheses. This choice of design is well-suited for capturing employee perceptions and the extent of these perceptions.

A cross-sectional survey⁸ method was utilized, involving the collection of data at a single point in time from the target population. This design was chosen for its efficiency in gathering data on perceptions, attitudes, and practices concerning technology and efficiency across different employee demographics and roles within the bank simultaneously. The questionnaire served as the primary data collection instrument, selected for its ability to systematically gather standardized

⁸ A cross-sectional survey collects data from a sample at a single point in time, providing a snapshot of attitudes and perceptions as they exist during that period, rather than tracking changes over time.

information on attitudes, perceptions, and reported behaviors related to technological innovation and its effects on various facets of operational efficiency, as perceived by bank staff.

3.2.2 Study Population and Sample

The study population comprised employees from two CPA units:

- All employees of CPA's Relizane Branch, a key operational unit. This population was selected for its direct exposure to the daily implementation of technological innovations and interaction with customers using these technologies. The total number of employees at this branch was 23, based on preliminary consultations with branch management.
- All employees of CPA's Directorate of Marketing and Communication. This population was selected for its involvement in the strategic planning and bank-wide perspective. The total number of employees in this directorate was 22, based on preliminary consultations with a senior executive.

A convenience sampling technique was employed to select participants, justified by practical constraints such as accessibility and willingness to participate.

The sampling criteria required participants to be current CPA employees with at least six months of experience, ensuring familiarity with technological systems and operational workflows. The demographic breakdown included gender, age, education level, position, department, and years of experience, providing a comprehensive profile of respondents.

3.2.3 Data Sources

This study utilized both primary and secondary data sources to achieve its research objectives.

3.2.3.1 Primary Data Sources

The primary data for this research were gathered through two main methods:

- **Questionnaire Survey:** An in-depth, structured questionnaire was the exclusive instrument for collecting original data directly relevant to the study's research questions and for testing the hypotheses. This survey was administered to employees of the CPA Relizane branch and the CPA Directorate of Marketing and Communication. The questionnaire data provided quantitative measures of employee perceptions regarding technological innovation, various dimensions of operational efficiency, and barriers to technological adoption. The decision to rely exclusively on this survey data for hypothesis testing was supported by careful instrument design, pre-testing, and validation procedures to ensure data quality and relevance for rigorous statistical analysis. This clearly demarcates the role of the survey for quantitative analysis.
- **Structured Interview:** A structured interview⁹ was conducted on May 18th, 2025 with the Branch Director of CPA Relizane. This interview was selected as a primary data source to obtain qualitative insights, managerial perspectives, and contextual information aligned with the research objectives. The director's positional authority and institutional knowledge were considered valuable for enriching the understanding derived from the quantitative survey data.

3.2.3.2 Secondary Data Sources

While primary survey data form the core of the empirical analysis, secondary data sources were consulted to enrich the study's context. These secondary sources included:

⁹ Structured interviews use predetermined, standardized questions asked in identical order to ensure consistency and reduce bias, while unstructured interviews employ flexible, conversational approaches that adapt to individual responses. Semi-structured interviews combine both methods.

- **Academic Literature:** A wide range of peer-reviewed articles, academic books, and prior research studies were reviewed. These provided the theoretical frameworks (e.g., Davis, 1989) and empirical findings from other banking contexts (e.g., Lee et al., 2021, on Chinese banks). This literature was crucial in designing the survey instrument, as many questionnaire items were adapted from established themes and constructs, and in shaping the study's hypotheses regarding the relationships between variables

- **Industry and Institutional Reports:** Reports and official documentation from CPA itself (such as annual reports and press releases) and from the Bank of Algeria were consulted to frame the study within the current operational and regulatory environment. These documents provided information on technological initiatives undertaken by CPA, publicly available efficiency or performance indicators for the bank, and broader trends in the Algerian banking sector. Additionally, regulatory documents, such as Algeria's 2023 Monetary and Banking Law, and central bank reports on infrastructure development and payment system usage, offered insights into the external factors influencing technological adoption and bank efficiency in the country.

3.2.4 Data Collection Instrument

The questionnaire was meticulously constructed to align with the study's objectives and theoretical frameworks. It consisted of five sections: (A) demographic information, (B) technological innovation, (C) operational efficiency (subdivided into resource utilization, transaction processing, employee productivity, and customer experience/service quality), and (D) barriers to technological adoption. Each section, except demographics (e.g., gender, age, education level, job title, experience), utilized a 5-point Likert scale¹⁰ (1 = Strongly Disagree, 5 = Strongly Agree) to measure attitudes and perceptions, a widely accepted method for quantifying subjective data in social sciences.

¹⁰ A Likert scale is a widely used psychometric tool that allows respondents to express their level of agreement or disagreement with a series of statements, enabling the quantification of attitudes or perceptions.

Table 3.1: Five-Point Likert Scale Interpretation

Response Category	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
Score	1	2	3	4	5

Source: Prepared by the student

The same questionnaire was administered to employees in both the Relizane branch and the Directorate of Marketing and Communication to ensure consistency in data collection across the two groups, allowing for the aggregation and holistic analysis of perceptions.

3.2.5 Validity and Reliability

To ensure validity, several measures were undertaken. Content validity was established by basing questionnaire items on a thorough literature review and expert consultation with two banking professionals and an academic supervisor, confirming comprehensive coverage of relevant constructs. Construct validity was supported by aligning items with established theoretical frameworks, ensuring they measured intended concepts. Face validity was verified through a pilot test with the Branch director, who confirmed the clarity and relevance of items, leading to minor wording adjustments.

Reliability testing was conducted to assess the internal consistency of the multi-item scales used in the questionnaire. Cronbach's alpha (α) coefficient was calculated for each construct: Technological Innovation, Resource Utilization Efficiency, Transaction Processing Efficiency,

Employee Productivity, Service Quality and Customer Experience, and Barriers to Technological Adoption.

Table 3.2: Internal Consistency Reliability (Cronbach's Alpha)

Construct Scale Name	Cronbach's Alpha (α)	Number of Items
Combined Study Scales	0.872	44

Source: Prepared by the student based on survey data

The overall Cronbach's alpha coefficient of 0.872 for the combined study scales (44 items) indicates excellent internal consistency reliability, exceeding the commonly accepted threshold of 0.7. This strong alpha value demonstrates robust reliability across the measurement scales, particularly noteworthy given the small sample size (N=34) of this study. The high internal consistency suggests that the items within the scales are measuring similar constructs and are strongly interrelated, providing a solid foundation for the subsequent analyses conducted in this research. This reliability assessment excludes demographic items.

3.2.6 Data Analysis Techniques

This study employed a quantitative approach to analyze the data collected from the combined sample of 34 employees from Crédit Populaire d'Algérie (CPA), encompassing respondents from both the Relizane Branch and the Directorate of Marketing and Communication. The Statistical Package for the Social Sciences¹¹ (SPSS), Version 27, was utilized for all statistical analyses.

¹¹ SPSS is a widely used software application for statistical analysis in social science and business research.

The choice of statistical tests was guided by the research objectives and the nature of the hypotheses being tested. The primary analytical techniques included:

- **Descriptive Statistics:** Frequencies, percentages, means, and standard deviations were calculated to summarize the demographic characteristics of the respondents (e.g., gender, age) and to describe the central tendencies and spread of responses for the main study variables (Technological Innovation, the four dimensions of Operational Efficiency, and Barriers to Technological Adoption).
- **Reliability Analysis:** Cronbach's alpha coefficient was calculated to assess the internal consistency and reliability of the multi-item Likert scales used in the questionnaire, as detailed in the preceding section.
- **Hypothesis Testing:**
 - For **Hypothesis H₀₁** (Impact of Technological Innovation on Overall Efficiency) and its **sub-hypotheses H_{0a}, H_{0b}, H_{0c}, and H_{0d}** (Impact of Technological Innovation on Resource Utilization, Transaction Processing Speed, Employee Productivity, and Service Quality, respectively), and **Hypothesis H₀₂** (Impact of Barriers to Technological Adoption on Bank Efficiency), a **simple linear regression analysis** was employed. This technique was used to determine the extent to which perceived Technological Innovation (the independent variable) predicts perceived Overall Efficiency and each of its specific dimensions (the dependent variables) and the extent to which barriers to technological adoption predict bank efficiency. The statistical significance of these relationships was determined by examining the p-value associated with the regression models.

The interpretation of mean scores for all Likert-scale items, was guided by a pre-defined categorization based on the 5-point scale. With a scale range of $(5-1) = 4$, and three desired importance categories (Low, Medium, High), the category length was determined as $4 \div 3 \approx 1.33$. This led to the following interpretation thresholds for mean scores:

- Low Importance/Agreement: Mean score from 1.00 to 2.33
- Medium Importance/Agreement: Mean score from 2.34 to 3.67
- High Importance/Agreement: Mean score from 3.68 to 5.00

This categorization allowed for a qualitative interpretation of the quantitative Likert-scale data, highlighting areas of perceived strength, weakness, or neutrality.

For all inferential statistical tests (regressions for H₀₁ and its sub-hypotheses and H₀₂), a significance level (alpha) of 0.05 was used. A p-value below 0.05 would lead to the rejection of the null hypothesis, while a p-value above 0.05 would result in the acceptance (failure to reject) of the null hypothesis.

3.3 Study Results

This section presents the findings derived from the statistical analysis of the questionnaire data collected from the CPA Relizane branch and the CPA Directorate of Marketing and Communication employees .

Table 3.3: Questionnaire Distribution and Response Rate

Variables	Number	Percentage (%)
Questionnaires Distributed	45	100
Questionnaires Returned	34	75.5
Questionnaires Discarded	0	0.0
Valid Questionnaires Used	34	75.5

Source: Prepared by the student

Out of 45 questionnaires distributed to employees across various departments, 34 were returned, yielding about a 75% response rate. After screening for completeness, 34 responses were deemed suitable for analysis, representing an adequate sample size for statistical inference given the population size.

3.3.1 Descriptive Analysis of Demographic Variables

The demographic characteristics of the 34 respondents are summarized in Table 3.4.

Table 3.4: Frequency and Percentage Distribution of Respondents by Demographic Variables

Variable	Category	Frequency (N)	Percentage (%)
Gender	Male	13	38.2
	Female	21	61.8
	Total	34	100
Age Group	20-30 years	5	14.7
	31-40 years	13	38.2
	41-50 years	10	29.4
	51-60 years	6	17.6
	>60 years	0	0.0
	Total	34	100
Education Level	High School	3	8.8
	Bachelor	18	52.9
	Master	8	23.5
	Doctorate	0	0
	Cert.	1	2.9
	Other	4	11.8
	Total	34	100
Position	Research Analyst	14	41.2
	Head of Department	13	38.2
	Senior Executive	3	8.8
	Client Relationship Manager	1	2.9
	Bank Teller	3	8.8
	Total	34	100

Department	Customer Service	2	5.9
	Trade Finance	3	8.8
	Credit	5	14.7
	Executive Secretary Office	2	5.9
	Teller Services	6	17.6
	Internal Audit	2	5.9
	Administrative Service	2	5.9
	Executive Management	3	8.8
	Marketing	2	5.9
	Communication	2	5.9
	Training	2	5.9
	Other	3	8.8
	Total	34	100
Years of Experience	<1 year	1	2.9
	1-5 years	10	29.4
	6-10 years	7	20.6
	11-15 years	2	5.9
	16-20 years	3	8.8
	>20 years	11	32.4
	Total	34	100

Source: Prepared by the student based on survey data

Table 3.4 summarizes the demographic profile of the respondents. Of the 34 bank staff members surveyed, 21 were female (61.8%) and 13 were male (38.2%). The most represented age cohort was 31-40 years (n = 13, 38.2%), followed by 41-50 years (n = 10, 29.4%), 51-60 years (n = 6, 17.6%), and 20-30 years (n = 5, 14.7%); notably, no participants were aged over 60 years.

Educationally, Bachelor's degree holders predominated (n = 18, 52.9%), with Master's degrees (n = 8, 23.5%) and high-school certificates (n = 3, 8.8%) also represented. Other educational qualifications accounted for 11.8% (n = 4) of respondents, while one participant (2.9%) held a certificate qualification. No respondents reported holding a Doctorate degree.

In terms of position, Research Analysts comprised the largest group (n = 14, 41.2%), followed closely by Heads of Department (n = 13, 38.2%). Senior Executives and Bank Tellers each represented 8.8% (n = 3) of respondents, while Client Relationship Managers accounted for 2.9% (n = 1).

Departmental distribution was led by Teller Services (n = 6, 17.6%) and Credit (n = 5, 14.7%), with smaller but equal proportions in Trade Finance and Executive Management (each n = 3, 8.8%). Customer Service, Executive Secretary Office, Internal Audit, Administrative Service, Marketing, Communication, and Training departments each represented 5.9% (n = 2) of the sample, while 'Other' departments accounted for 8.8% (n = 3).

Regarding tenure, the largest proportion of respondents reported more than 20 years of service (n = 11, 32.4%), followed by those with 1-5 years (n = 10, 29.4%) and 6-10 years (n = 7, 20.6%). Smaller proportions had 16-20 years (n = 3, 8.8%) and 11-15 years (n = 2, 5.9%) of experience, while only one participant (2.9%) had less than one year's experience.

3.3.2 Descriptive Statistics of Main Variables

This subsection presents the descriptive statistics (mean and standard deviation) for the items measuring our variables.

Table 3.5: Descriptive Statistics for Technological Innovation items

Item	Statement	Mean	Std. Deviation	RANK	IMPORTANCE
TI1	CPA Bank has significantly expanded its digital banking services and products in the past three years.	4.35	.544	2	High
TI2	The bank's electronic payment systems (Mobile CPA, E-Banking,	4.24	.654	3	High

	ATMs) are reliable, secure, and meet customer needs.				
TI3	CPA provides adequate technical infrastructure and support systems to maintain digital banking operations.	4.21	.687	4	High
TI4	Management actively promotes technological innovation and addresses resistance to change effectively.	4.15	.784	5	High
TI5	Technical support and system maintenance ensure minimal disruption to digital banking services.	4.15	.657	5	High
TI6	Staff receive sufficient training on new technologies before implementation.	4.00	1.04	7	High
TI7	The bank has implemented robust cybersecurity measures to protect digital banking operations.	4.41	.557	1	High
TI8	CPA's digital services are competitive with other banks in the Algerian market.	4.00	1.015	7	High

Source: Prepared by the student based on survey data

The results indicate that the bank's cybersecurity measures (TI7, M = 4.41, SD = 0.557) received the highest rating, followed by the expansion of digital banking services (TI1, M = 4.35, SD = 0.544). Electronic payment systems (TI2, M = 4.24, SD = 0.654) ranked third, while technical infrastructure support (TI3, M = 4.21, SD = 0.687) ranked fourth. Management's promotion of innovation (TI4, M = 4.15, SD = 0.784) and the quality of technical support (TI5, M = 4.15, SD =

0.657) both ranked fifth. Staff training on new technologies (TI6, M = 4.00, SD = 1.04) and the competitiveness of CPA's digital services (TI8, M = 4.00, SD = 1.015) received the lowest ratings, although both still fell within the high importance range.

Table 3.6: Descriptive Statistics for Resource Utilization Items

Item	Statement	Mean	Std. Deviation	Rank	Importance
RU1	Technological innovations have reduced the physical storage space needed for banking records and documentation.	3.79	1.038	5	High
RU2	Digital platforms have decreased the frequency of customers needing to visit branches for routine transactions.	3.79	.978	5	High
RU3	Technological innovations have improved the bank's capacity to handle peak transaction periods without additional resources.	3.94	.983	3	High
RU4	Current digital systems allow the branch to serve more	3.76	1.103	7	High

	customers without increasing physical infrastructure.				
RU5	Technology adoption has improved the utilization rate of existing banking equipment and resources.	3.71	.836	8	High
RU6	Digital tools have reduced redundancy in resource allocation across different banking functions.	3.53	.929	9	Medium
RU7	Self-service technologies have optimized the distribution of customer service resources throughout the day.	4.09	.753	1	High
RU8	Banking technology has enabled more efficient allocation of branch office space for customer service.	3.85	.892	4	High
RU9	Digital documentation systems have enabled more efficient retrieval and use of banking information resources.	4.00	1.015	2	High

Source: Prepared by the student based on survey data

The descriptive statistics for Resource Utilization (RU) indicate that item RU7, concerning the optimization of customer service resources through self-service technologies, recorded the highest mean ($M = 4.09$, $SD = 0.753$). This was followed closely by RU9 ($M = 4.00$, $SD = 1.015$), relating to efficient retrieval and usage of banking information through digital documentation systems. Item RU3, addressing the bank's improved capacity to manage peak transaction periods

efficiently, was rated third highest ($M = 3.94$, $SD = 0.983$). Items RU1 and RU2, pertaining respectively to reductions in physical storage for banking records and fewer branch visits by customers due to digital platforms, received identical means ($M = 3.79$). The lowest-rated item was RU6 ($M = 3.53$, $SD = 0.929$), indicating respondents' relatively neutral stance on the reduction of redundancy in resource allocation through digital tools.

Table 3.7: Descriptive Statistics for Transaction Processing Speed Items

Item	Statement	Mean	Std. Deviation	Rank	Importance
TP1	Remote banking platforms have significantly improved transaction processing speeds.	4.29	0.579	2	High
TP2	Automated clearing systems have reduced the time required for check processing.	4.09	0.965	4	High
TP3	Electronic payment systems have reduced errors in transaction processing.	3.85	0.784	6	High
TP4	Mobile banking has reduced processing time for routine customer transactions.	4.18	0.758	3	High
TP5	Digital systems have enabled real-time transaction processing capability.	3.62	1.101	8	Medium
TP6	Card payment processing is faster than traditional cash handling methods.	4.00	1.128	5	High

TP7	Digital account opening is significantly faster than paper-based methods.	3.82	0.797	7	High
TP8	ATMs effectively handle basic customer transactions that would otherwise increase teller workloads.	4.32	0.912	1	High

Source: Prepared by the student based on survey data

The descriptive analysis for Transaction Processing Efficiency (TP) shows the highest rating for TP8 (M = 4.32, SD = 0.912), highlighting agreement that ATMs effectively handle basic transactions, reducing teller workloads. Item TP1, related to remote banking platforms improving transaction speeds, was ranked second highest (M = 4.29, SD = 0.579). TP4, focusing on the efficiency of mobile banking in processing routine transactions, followed closely (M = 4.18, SD = 0.758). Lower ratings appeared in TP3 (M = 3.85, SD = 0.784), concerning the reduction of errors due to electronic payment systems, and TP7 (M = 3.82, SD = 0.797), on the efficiency of digital account opening compared to paper methods. TP5, regarding real-time transaction processing capabilities of digital systems, received the lowest mean (M = 3.62, SD = 1.101), categorizing it as medium importance.

Table 3.8: Descriptive Statistics for Employee Productivity Items

Item	Statement	Mean	Std. Deviation	Rank	Importance
EP1	Technological innovations have significantly enhanced overall employee productivity at CPA Bank.	4.06	0.919	5	High

EP2	Automation of routine tasks allows staff to focus on more value-added activities.	4.29	0.719	2	High
EP3	Digital tools have minimized manual data entry and paperwork.	4.12	0.808	4	High
EP4	Customer information systems provide easy access to account data, improving service efficiency.	4.24	0.699	3	High
EP5	Staff can serve more customers per day due to technological innovations.	4.35	0.691	1	High
EP6	Digital workflows have reduced processing bottlenecks in daily operations	4.09	0.830	6	High
EP7	Performance analytics help staff identify areas for productivity improvement.	3.91	1.055	7	High

Source: Prepared by the student based on survey data

Table 3.8 presents Employee Productivity (EP) descriptive statistics, showing EP5, related to staff serving more customers per day due to technological innovations, received the highest mean ($M = 4.35$, $SD = 0.691$). Item EP2, addressing automation of routine tasks allowing staff to engage in value-added activities, ranked second ($M = 4.29$, $SD = 0.719$). EP4, highlighting ease of accessing customer information, ranked third ($M = 4.24$, $SD = 0.699$). EP3, which pertains to digital tools minimizing manual data entry, received a moderate rating ($M = 4.12$, $SD = 0.808$). The lowest-rated item was EP7 ($M = 3.91$, $SD = 1.055$), related to the role of performance analytics in identifying productivity improvements, yet remained within the high importance range.

Table 3.9: Descriptive Statistics for Service Quality and Customer Experience Items

Item	Statement	Mean	Std. Deviation	Rank	Importance
SQ1	Technological innovations have noticeably reduced customer wait times.	4.29	0.629	3	High
SQ2	Digital channels (mobile/online) have increased customer access to banking services.	4.00	0.778	8	High
SQ3	Electronic notifications (e.g., SMS, email) have improved communication with customers.	4.50	0.663	1	High
SQ4	Digital tools provide more personalized service to customers.	4.24	0.699	5	High
SQ5	Customer complaints related to service delays have decreased with digital adoption.	4.26	0.618	4	High
SQ6	The 24/7 availability of digital channels has improved customer convenience.	4.15	0.857	6	High
SQ7	Customers have positively responded to CPA's digital service offerings.	4.47	0.563	2	High

SQ8	Technology helps staff resolve customer issues more efficiently.	4.09	0.866	7	High
------------	---	-------------	--------------	----------	-------------

Source: Prepared by the student based on survey data

The descriptive results for Service Quality and Customer Experience demonstrate the highest rating for SQ3 (M = 4.50, SD = 0.663), indicating agreement regarding improved communication with customers through electronic notifications. SQ7, reflecting customers' positive response to CPA's digital offerings, closely follows (M = 4.47, SD = 0.563). SQ1, relating to reduced customer wait times due to technological innovations, ranks third (M = 4.29, SD = 0.629). SQ5, addressing the decline in customer complaints about service delays after adopting digital services, and SQ4, about digital tools providing personalized customer services, received moderate agreement (M = 4.26, SD = 0.618; M = 4.24, SD = 0.699 respectively). SQ2, which addresses increased customer access via digital channels, had the lowest mean (M = 4.00, SD = 0.778) but remained within the high importance range.

Table 3.10: Descriptive Statistics for Barriers to Adoption Items

Item	Statement	Mean	Std. Deviation	Rank	Importance
BR1	Customer preferences for cash and face-to-face transactions limit digital banking adoption.	4.03	1.058	4	High
BR2	Limited customer digital literacy and trust concerns negatively affect digital service usage.	4.44	0.660	2	High

BR3	Cybersecurity concerns limit the implementation of certain digital banking features.	4.09	0.621	3	High
BR4	The regulatory framework for digital banking in Algeria requires further development.	4.47	0.788	1	High

Source: Prepared by the student based on survey data

Table 3.10 highlights the descriptive statistics for Barriers to Adoption (BR). The highest-rated item, BR4 (M = 4.47, SD = 0.788), concerned regulatory framework limitations for digital banking. BR2, addressing limited customer digital literacy and trust concerns affecting service usage, was rated second highest (M = 4.44, SD = 0.660). Item BR3, regarding cybersecurity concerns restricting digital banking features, and BR1, on customer preference for cash transactions limiting digital adoption, received relatively lower ratings (M = 4.09, SD = 0.621; M = 4.03, SD = 1.058 respectively), though both remained within the high importance range

3.3.3 Presentation of Interview Data: CPA Relizane Branch Director

To complement the quantitative survey data, a structured interview was conducted with the Director of the CPA Relizane branch. This qualitative data provides valuable managerial context, often corroborating or explaining the survey findings. The key themes and responses are summarized in Table 3.11.

Table 3.11: Summary of Interview with CPA Relizane Branch Director

Interview Question	Response from the CPA Relizane branch Director
I. Introduction and Overview of the branch's Technological Environment	
From your perspective as the head of the Relizane branch, could you describe the most	Customers are increasingly using online banking, primarily for transfers and balance

notable technological tools or systems with which your staff and customers interact daily?	inquiries. The recent launch of our "Wimpay CPA" application offers more options to our clients than our other application, "CPA Mobile," especially with instant payments. This has led to reduced foot traffic at our counters, although a cash-based culture still prevails, particularly among older individuals.
Thinking about daily operations here in Relizane, how would you describe the branch's typical level of dependence on these technologies for essential banking functions?	Our dependence is moderate. We receive significantly fewer requests for account statements or balance consultations at the counter due to these technologies.
II. Perceived Impact of Technology on Branch Operations and Customer Service	
Based on your observations within this branch, in what ways have specific technological introductions (e.g., new software, ATMs, online service portals) influenced how common banking tasks are managed by your staff?	There haven't been major operational changes at the staff level yet. However, we are anticipating a new update to our internal information system soon, which promises more fluidity in banking tasks within the bank.
According to your observations, what impact has technology had on the speed or flow of customer transactions in your branch?	The connection between CPA agencies has been improved since 2018; previously, inter-branch transfers took D+2 ¹² (two business days). After 2018, transfers are completed on the same day. This improvement was termed as the centralization of CPA agencies.
III. Staff Adaptation and Operational Experience	
When new technologies or systems are deployed at the Relizane branch, what is the typical process for familiarizing your staff with these changes?	Staff dedicated to these new technologies are sent for training. We have also recently begun conducting some staff training via video conference, eliminating the need for travel.
Given the specific environment and clientele of the Relizane branch, are there any particular aspects of the implemented technologies that you find particularly well-suited, or perhaps less suited, to your local operational needs?	The majority of the technologies are well-suited to our clients' needs, especially for younger customers who demand more digitalization.
IV. Localized Challenges and Observations	
This research notes that the Algerian banking sector is characterized by a cash-centric	The bank continues its efforts to accelerate adoption, but we do note some factors

¹² D+2' is a financial settlement term meaning the transaction is completed two business days after the day of the transaction (Day 'D')

economy and, in some regions, by underdeveloped digital infrastructure. From your experience at the Relizane branch, how do these broader factors influence the adoption and effective use of technological innovations by your customers and staff?

influencing this. For example, our Point of Sale (POS) terminals are distributed free of charge almost everywhere in Relizane, notably in all pharmacies and supermarkets, but they remain underutilized. The reasons vary: sometimes it's their customers who prefer cash, and other times it's the merchants who don't offer the option to pay with the POS, despite occasional follow-ups from our bank.

When the branch encounters technical problems or disruptions with banking systems, what is the typical impact on operations and customer service here in Relizane, and how are these situations generally managed at your level?

Disruptions are rare, especially since we have backup systems, such as a fiber optic internet connection and an ADSL backup in case of an outage. Our internal system is continuously monitored from Algiers; they are always aware of any disruptions, so issues are generally resolved quickly.

V. Final Remarks

Are there any other aspects related to the daily use of technology and its effects on branch operations or customer service here in Relizane that you deem important for my understanding within the scope of this research?

It is important to emphasize that our solutions are adapted to the needs of our clients for their current operations, even for merchants to pay their bills and taxes without having to travel. The recent introduction in 2025 of Cpaye+, the deferred payment card, is the first of its kind and gives our customers the option to spend today and pay later with peace of mind. We also recently introduced Wimpay CPA, which allows them to pay with a simple QR code or make instant transfers without needing the other person's bank identification code. These new innovations, in addition to the presence of POS terminals, ATMs, and digital spaces throughout almost the entire national territory, position CPA as one of the leaders in technological innovation in Algeria. The introduction of CPA to the stock market is also attracting more customers.

Source: Prepared by the student based on an interview with the Director, Crédit Populaire d'Algérie - Relizane branch (May 18, 2025)

3.3.4 Supporting Financial Data: CPA's Technological Investments and Performance

To provide a quantitative backdrop to the qualitative and survey-based findings of this study, this subsection presents summarized financial data reflecting Crédit Populaire d’Algérie’s commitment to technological advancement and the corresponding performance in its technological service and product offerings. This data underscores the bank's active pursuit of digital transformation and the market's response.

Table 3.12: CPA Investment in and Revenue from Monetics and Digital Services (2021-2024)

Year	Investment in Monetics¹³ and Digital Services (million DA)	Revenue from Monetics and Digital Services (million DA)
2021	35.3	512
2022	53.5	619
2023	N/A	716
2024	N/A	832

Source: Compiled by the student from Crédit Populaire d’Algérie Annual Reports

Table 3.13: CPA Key Performance Indicators: Monetics and Digital Services (2021-2024)

Indicator	2021	2022	2023	2024
Cards & Payments				
Total Domestic CIB Cards in Circulation	393,736	449,067	516,377	587,016
International Cards in Circulation (VISA/Mastercard)¹⁴	34,551	34,716	37,182	45,096
Affiliated Web Merchants	25	58	73	98
Infrastructure				
ATMs (DAB/GAB) Operational (End of Year)	N/A	185	209	224
POS Terminals (TPE) Operational (End of Year)	N/A	N/A	10,737	12,185
Digital Services Subscribers				

¹³ Monetics' (from the French 'monétique') refers to the technologies and systems involved in electronic payment transactions, including cards, terminals, and processing networks.

¹⁴ Figures for 2021 and 2022 primarily represent VISA cards, as per the available data. Data for 2023 and 2024 includes both VISA and Mastercard

SMS Service Subscribers (SMS CARDS CIB & VISA)	41,609	54,027	67,291	106,777
New E-banking Subscribers (annual)	N/A	40,330	41,390	53,240
Total Active E-banking Clients (End of Year)	N/A	N/A	N/A	222,372
New Mobile CPA Subscribers (annual) ¹⁵	N/A	81,011	123,597	178,221

Source: Compiled by the student from Crédit Populaire d'Algérie Annual Reports

3.3.5 Hypothesis Testing:

In this section, simple linear regression analyses are conducted to test the research hypotheses related to the impact of Technological Innovation (TI) and Barriers to Adoption (BR) on the operational efficiency dimensions at Crédit Populaire d'Algérie (CPA). The statistical significance of each relationship is determined by examining the significance level (p-value). A significance value below 5% ($p < 0.05$) will lead to the rejection of the null hypothesis, whereas a significance value above 5% ($p > 0.05$) will indicate acceptance of the null hypothesis.

Main Hypotheses

- **Hypothesis H01:** Technological innovation has no significant effect on the overall perceived efficiency of Crédit Populaire d'Algérie (CPA).

Table 3.14: Regression Analysis of TI predicting Overall Efficiency

Predictor	R	R²	Sig. (p-value)
TI	.382	.146	.026

Source: Prepared by the student based on survey data

¹⁵ The "Mobile CPA" service was launched in 2021. Figures represent new subscribers for the respective year.

The analysis indicates a moderate positive correlation ($R = .382$) between Technological Innovation and Overall Efficiency. The coefficient of determination ($R^2 = .146$) suggests that Technological Innovation explains approximately 14.6% of the variance in Overall Efficiency. The significance value ($p = .026$) is below the 5% threshold, leading to rejection of the null hypothesis.

Hypothesis H₀₂:

Table 3.15: Regression Analysis of BR predicting Overall Efficiency

Predictor	R	R ²	Sig. (p-value)
BR	.054	.003	.760

Source: Prepared by the student based on survey data

Results show a negligible correlation ($R = .054$) between Barriers to Technological Adoption and Overall Efficiency. The R^2 value (.003) indicates that less than 1% of the variation in Overall Efficiency is explained by Barriers. The significance value ($p = .760$) exceeds 5%, indicating that the null hypothesis is accepted.

Sub-Hypotheses

- **Hypothesis H_{0a}:** Technological innovation has no significant effect on perceived resource utilization efficiency at CPA Bank.

Table 3.16: Regression Analysis of TI predicting RU

Predictor	R	R ²	Sig. (p-value)
TI	.232	.054	.186

Source: Prepared by the student based on survey data

The regression analysis demonstrates a weak correlation ($R = .232$) between Technological Innovation and Resource Utilization, with $R^2 = .054$. The significance value ($p = .186$) is above the 5% threshold, indicating that the null hypothesis is accepted.

- **Hypothesis H_{0b}:** Technological innovation has no significant effect on perceived transaction processing speed at CPA Bank.

Table 3.17: Regression Analysis of TI predicting TP

Predictor	R	R ²	Sig. (p-value)
TI	.245	.060	.163

Source: Prepared by the student based on survey data

The relationship between Technological Innovation and Transaction Processing Speed shows a weak correlation ($R = .245$), explaining about 6% ($R^2 = .060$) of the variance. The significance value ($p = .163$) is higher than 5%, thus the null hypothesis is accepted.

- **Hypothesis H_{0c}:** Technological innovation has no significant effect on perceived employee productivity at CPA Bank.
-

Table 3.18: Regression Analysis of TI predicting EP

Predictor	R	R ²	Sig. (p-value)
TI	.273	.075	.118

Source: Prepared by the student based on survey data

Results indicate a weak correlation ($R = .273$) between Technological Innovation and Employee Productivity. The variance explained ($R^2 = .075$) is approximately 7.5%. With a significance level ($p = .118$) above 5%, the null hypothesis is accepted.

- **Hypothesis H_{0d}:** Technological innovation has no significant effect on perceived service quality and customer experience at CPA Bank.

Table 3.19: Regression Analysis of TI predicting SQ

Predictor	R	R ²	Sig. (p-value)
TI	.414	.172	.015

Source: Prepared by the student based on survey data

The regression analysis indicates a moderate correlation ($R = .414$) between Technological Innovation and Service Quality. Approximately 17.2% ($R^2 = .172$) of the variance is explained by Technological Innovation. With a significance value ($p = .015$) below 5%, the null hypothesis is rejected.

3.4 Results Discussion

3.4.1 Introduction to the Results Discussion

This section transitions from the presentation of empirical findings to their comprehensive interpretation and contextualization. The primary objective is to explain the meaning and implications of the study results, which are derived from the questionnaire as well as insights from a structured interview with the Relizane branch director and supporting financial and performance data for CPA. This section aims to provide a clear, nuanced, and integrated understanding of technology's perceived role and effect at CPA Bank.

3.4.2 Discussion of Respondent Demographics

The demographic profile of the 34 respondents from CPA Bank, as summarized in Table 3.4, offers an important backdrop for interpreting the study's findings. The sample exhibited a higher proportion of female employees (61.8%) compared to male employees (38.2%), reflecting the gender composition within the participating units or perhaps broader trends within certain departments of the Algerian banking sector. The age distribution indicates a workforce predominantly in their mid-career stages, with the largest cohort aged 31-40 years (38.2%), followed by those aged 41-50 years (29.4%). This suggests that many employees possess a

substantial period of experience, potentially encompassing banking practices both before and after significant technological advancements. This experiential diversity can enrich the perspectives on technological change, as staff who have witnessed multiple technological cycles may offer different insights compared to newer employees.

Educationally, the sample is well-qualified, with Bachelor's degree holders forming the majority (52.9%), and a significant group holding Master's degrees (23.5%). This relatively high level of education within the surveyed staff suggests a good capacity for understanding, adapting to, and potentially leveraging technological innovations, which is a positive indicator for modernization efforts within Algerian banking institutions like CPA.

The distribution of respondents by position indicates that the study captured views from both strategic and operational echelons. Research Analysts (41.2%) and Heads of Department (38.2%) were the most represented groups. This diversity is valuable as it allows for a more holistic understanding of technology's effect, combining perspectives from those involved in planning and oversight with those closer to day-to-day operations or specialized analytical functions. The departmental distribution also reflects a broad cross-section of the bank's activities, with Teller Services (17.6%) and the Credit department (14.7%) being well-represented, alongside employees from Trade Finance, Marketing, Communication, Internal Audit, and Executive Management, among others. This multifaceted representation ensures that the findings are not skewed by the experiences of a single functional area.

Finally, the data on years of experience reveal a balanced mix. A substantial proportion of respondents are long-serving employees, with 32.4% having more than 20 years of experience, while another large group (29.4%) has between 1 and 5 years of experience. This blend is advantageous as it combines deep institutional knowledge and long-term perspectives with potentially more contemporary insights from newer staff members who may have joined CPA during more recent phases of its technological evolution. This balance can provide a richer, more nuanced understanding of the perceived effects of innovation.

3.4.3 Interpreting Perceptions of Technological Innovation at CPA Bank

Employee perceptions of technological innovation (TI) at CPA Bank (Table 3.5) are generally positive. All eight items measuring TI were rated as 'High Importance'. This suggests staff recognize CPA's technological advancements.

Cybersecurity measures (TI7: "The bank has implemented robust cybersecurity measures to protect digital banking operations") received the highest agreement. This indicates strong staff confidence in the security of CPA's digital platforms, which is vital for operational stability and customer trust. The Relizane Branch Director also noted that disruptions are rare due to backup systems and continuous monitoring from Algiers, ensuring issues are resolved quickly.

The expansion of digital services (TI1: "CPA Bank has significantly expanded its digital banking services and products in the past three years") was also highly rated. This aligns with CPA's strategic goals to modernize and broader trends in Algerian banking digitalization noted by Benahmed et al. (2024) and Ouahab and Koudjil (2024). The Branch Director highlighted the increasing customer use of online banking for transfers and balance inquiries, and the launch of "Wimpay CPA" offering more options like instant payments. He further emphasized that CPA's solutions, including new products like the Cpaye+ deferred payment card and Wimpay CPA for QR code payments, position CPA as a leader in technological innovation in Algeria.

The reliability of digital infrastructure (TI2, TI3) was also well-regarded, which is essential for smooth digital services. However, staff training on new technologies (TI6: "Staff receive sufficient training on new technologies before implementation"), while rated 'High Importance', was at the lower end of this category. This suggests room for improvement. The Relizane Branch Director mentioned that staff dedicated to new technologies are sent for training, and some training is now conducted via video conference. Effective training is crucial for maximizing the benefits of new systems.

Similarly, the competitiveness of CPA's digital services (TI8: "CPA's digital services are competitive with other banks in the Algerian market") scored towards the lower end of 'High

Importance'. While internal progress is recognized, staff may see CPA's services as not necessarily market-leading. This underscores the need for continuous innovation in Algeria's banking sector.

Strong agreement was found regarding management's role in fostering innovation (TI4) and ensuring operational continuity through technical support (TI5). This indicates a supportive environment for TI.

3.4.4 Interpreting Perceptions of Operational Efficiency Dimensions

The study explored employee views on how technological innovation impacts four areas of operational efficiency: resource utilization, transaction processing, employee productivity, and service quality/customer experience.

3.4.4.1 Resource Utilization Efficiency

Employee perceptions regarding the effect of technological innovation on Resource Utilization (RU) efficiency, as detailed in Table 3.6, are generally positive, with most items rated as being of 'High Importance/Agreement'. This suggests that staff see tangible benefits from technology in how the bank manages and deploys its resources.

The highest level of agreement was for the item "Self-service technologies have optimized the distribution of customer service resources throughout the day" (RU7, M=4.09). This indicates that employees recognize the value of technologies like ATMs, online banking portals, and mobile applications in managing customer interactions more efficiently, likely by diverting routine transactions away from teller counters. This aligns with the Relizane Branch Director's comment that the bank's dependence on technology is "moderate," with significantly fewer in-person requests for account statements or balance consultations at the counter due to the availability of these technologies. Such a shift can free up branch staff to focus on more complex advisory roles or higher-value customer interactions.

Efficiency in information management, reflected in the statement "Digital documentation systems have enabled more efficient retrieval and use of banking information resources" (RU9,

M=4.00), was also highly rated. This implies perceived improvements in internal processes related to data access and management, which are crucial for quick decision-making, regulatory compliance, and responsive customer service.

Employees also agreed that technological innovations have improved the bank's capacity to handle peak transaction periods without necessitating additional resources (RU3, M=3.94), and that current digital systems allow the branch to serve more customers without increasing physical infrastructure (RU4, M=3.76). Other benefits, such as reduced physical storage space needed for records (RU1, M=3.79) and a decreased frequency of customers needing to visit branches for routine transactions (RU2, M=3.79), were also acknowledged as being of 'High Importance/Agreement'. The Branch Director's confirmation that online banking has led to reduced foot traffic at counters supports this latter perception.

However, one item, "Digital tools have reduced redundancy in resource allocation across different banking functions" (RU6, M=3.53), fell into the 'Medium Importance/Agreement' category. This is a noteworthy finding. It suggests that while employees perceive benefits from technology at an individual task level (e.g., digital records save paper, RU1) or within their specific departments, the broader, systemic effect of technology in streamlining resource allocation and eliminating duplication across different banking functions might be less evident or not yet fully realized. For example, staff might not see how technology is making different departments work together with fewer overlapping resources. This perceived lack of significant effect on reducing systemic redundancy could be a contributing factor to why the overall statistical effect of technological innovation on resource utilization efficiency was not found to be significant in the subsequent hypothesis testing. If technology is not yet seen as comprehensively tackling inter-departmental redundancies, its full cost-saving potential may remain untapped, pointing to a need for deeper business process re-engineering. This is a core element of the "Perception-Implementation Gap" discussed later.

3.4.4.2 Transaction Processing Efficiency

Employee views on the effect of technology on Transaction Processing (TP) efficiency, with descriptive statistics presented in Table 3.7, indicate that technology is generally seen as enhancing the speed and accuracy of banking operations.

The statement "ATMs effectively handle basic customer transactions that would otherwise increase teller workloads" (TP8, M=4.32) received the highest agreement. This reflects the long-standing and well-recognized role of ATMs in improving operational efficiency by automating routine tasks and freeing up teller staff for more complex interactions. Similarly, "Remote banking platforms have significantly improved transaction processing speeds" (TP1, M=4.29) also garnered strong agreement, highlighting the perceived value of online and mobile channels in expediting customer transactions. The Relizane Branch Director corroborated this by noting that the connection between CPA agencies had significantly improved after 2018 due to a "centralization of CPA agencies," which allowed for same-day inter-agency transfers, a marked improvement from the previous D+2 timeframe. The efficiency of mobile banking in reducing processing time for routine customer transactions (TP4, M=4.18) was also highly rated.

Other aspects, such as automated clearing systems reducing the time required for check processing (TP2, M=4.09) and card payment processing being faster than traditional cash handling methods (TP6, M=4.00), were also viewed positively, falling within the 'High Importance/Agreement' category. The perception that electronic payment systems have reduced errors in transaction processing (TP3, M=3.85) and that digital account opening is significantly faster than paper-based methods (TP7, M=3.82) were also rated as 'High Importance/Agreement', though with slightly less emphasis than the top-rated items, suggesting some ongoing room for improvement in these areas.

A key finding within this dimension is the relatively lower agreement for the statement "Digital systems have enabled real-time transaction processing capability" (TP5, M=3.62), which was rated as 'Medium Importance/Agreement'. If employees doubt the comprehensive or universal availability of real-time processing across all transaction types or systems, it implies that potential delays or batch processing might still exist in certain areas. For instance, a customer might get cash fast from an ATM (TP8), but if a complex transfer still takes time because backend systems are not fully real-time (TP5), then overall transaction processing efficiency has not reached its full potential. This could be linked to broader infrastructural limitations within the Algerian banking

system or the complexities of integrating legacy systems with newer real-time platforms. Ouahab and Koudjil (2024) previously noted concerns regarding the "lack of technological infrastructure" in Algeria, which could manifest as constraints on achieving consistent, end-to-end real-time processing capabilities. This particular perception might contribute to the overall non-significant statistical finding for the effect of technology on transaction processing speed.

3.4.4.3 Employee Productivity

The assessment of perceived Employee Productivity (EP), detailed in Table 3.8, reveals a strong belief among CPA staff that technological innovation positively affects their work output and effectiveness. All items measuring this dimension were rated as being of 'High Importance/Agreement'.

The most significant perceived productivity gain was articulated in the statement "Staff can serve more customers per day due to technological innovations" (EP5, M=4.35). This directly links technology to increased throughput in customer service. Equally impactful was the view that "Automation of routine tasks allows staff to focus on more value-added activities" (EP2, M=4.29). This aligns with findings from studies like Obeng and Boachie (2018), which showed that process innovations, by automating mundane tasks, free up staff for higher-value work that may require more cognitive effort or interpersonal skills. The Relizane Branch Director's comment that while there haven't been major operational changes at the staff level yet, an anticipated update to the internal information system promises more fluidity in banking tasks, suggests an ongoing evolution in this area.

Easy access to customer information through dedicated systems (EP4, M=4.24) was also highly rated, as efficient access to accurate data is fundamental to providing quick and effective customer service and making informed operational decisions. Other general statements affirming that technological innovations have significantly enhanced overall employee productivity (EP1, M=4.06), that digital tools have minimized manual data entry and paperwork (EP3, M=4.12), and that digital workflows have reduced processing bottlenecks in daily operations (EP6, M=4.09) also received strong agreement from the respondents.

Despite these generally positive perceptions of productivity enhancements, the statement "Performance analytics help staff identify areas for productivity improvement" (EP7, M=3.91) received a slightly less emphatic rating compared to other items in this category, though it still fell within the 'High Importance/Agreement' range. This suggests that while staff members feel more productive due to the tools and automation provided by technology (e.g., completing tasks faster with new software, EP1, EP2), the systems or processes for using data-driven performance analytics to systematically identify and address areas for further productivity improvement might be perceived as less developed or less effectively utilized. If the bank does not have robust systems to track overall output, identify where time is truly saved, or where new bottlenecks emerge (EP7), then translating individual feelings of productivity into proven organizational gains becomes difficult. This could be a factor contributing to the non-significant statistical finding for this dimension in the hypothesis testing, as converting perceived individual productivity gains into measurable, systemic organizational productivity improvements often requires robust feedback loops and data-informed management practices. This is another facet of the "Perception-Implementation Gap."

3.4.4.4 Service Quality and Customer Experience

The effect of technological innovation on Service Quality (SQ) and the overall customer experience, as perceived by CPA employees (descriptive statistics in Table 3.9), was viewed very positively. All items related to this dimension received high 'High Importance/Agreement' ratings, indicating a strong belief that technology has substantially improved how CPA serves its customers. This is where technology's impact is perceived most strongly and positively, aligning with the significant regression result for H0d.

The statement "Electronic notifications (e.g., SMS, email) have improved communication with customers" (SQ3, M=4.50) garnered the highest level of agreement. This highlights the perceived value of proactive, timely, and convenient communication channels facilitated by technology, which is consistent with findings by Zouari and Abdelhedi (2021) who found that digitalization, including enhanced communication, significantly improves customer satisfaction in the banking sector.

The perception that "Customers have positively responded to CPA's digital service offerings" (SQ7, M=4.47) was also very high. This suggests that employees believe that the bank's investments in digital channels and services are being well-received by the customer base. The Relizane Branch Director's interview strongly corroborated this, confirming that most of the bank's technologies are well-suited to client needs, especially for younger customers who have a higher demand for digitalization. He also highlighted new offerings like "Wimpay CPA" for QR code payments and instant transfers, and the "Cpaye+" deferred payment card, as innovations that are adapted to client needs—including facilitating remote payments of bills and taxes for merchants—and which position CPA as a leader in the Algerian market.

Reduced customer wait times due to technological innovations (SQ1, M=4.29) was another highly rated benefit, as speed and convenience are critical components of customer satisfaction in financial services. Strong agreement was also observed for statements indicating that digital channels (mobile/online) have increased customer access to banking services (SQ2, M=4.00), that digital tools provide more personalized service to customers (SQ4, M=4.24), that customer complaints related to service delays have decreased with digital adoption (SQ5, M=4.26), that the 24/7 availability of digital channels has improved customer convenience (SQ6, M=4.15), and that technology helps staff resolve customer issues more efficiently (SQ8, M=4.09).

These findings collectively paint a picture of a strong conviction among CPA employees that technological innovation has holistically and significantly improved service delivery, customer interaction, and overall customer experience. Improvements in service quality are often directly visible and experienced by both customers and staff (e.g., a new user-friendly app, faster online service). This makes the benefits clear and consistently perceived, likely leading to strong agreement and statistical significance in hypothesis testing. This robust positive perception in the customer-facing domain is a key outcome of the study.

3.4.5 Interpreting Perceptions of Barriers to Technological Adoption

Employee views on the barriers to technological adoption at CPA, detailed in Table 3.10, revealed that all four identified barrier items were rated as being of 'High Importance/Agreement'. This indicates that while employees recognize CPA's technological advancements, they also

perceive significant obstacles that may impede the full adoption or optimal use of these technologies.

The most prominently perceived barrier was "The regulatory framework for digital banking in Algeria requires further development" (BR4, M=4.47). This very high level of agreement suggests a strong employee sentiment that existing regulations may not be fully conducive to, or supportive of, rapid digital innovation in the banking sector. This finding aligns with observations by scholars like Samir and Koudjil (2024), who noted that Algeria needs to invest in "improving legislation" to facilitate its digitization agenda. This is a strong signal to policymakers.

"Limited customer digital literacy and trust concerns negatively affect digital service usage" (BR2, M=4.44) was also rated as a very significant barrier. This points to crucial demand-side constraints. Even if banks offer advanced digital services, their adoption can be hampered if customers lack the necessary skills to use them or harbor concerns about security and privacy. Ouahab and Koudjil (2024) had previously noted that "consumer trust and familiarity with e-payments is still nascent" in Algeria, and Osei et al. (2023) highlighted similar challenges in fostering digital banking adoption in other emerging economies. The Relizane Branch Director's interview provided concrete examples of these challenges, stating that despite efforts like distributing Point of Sale (POS) terminals free of charge, they often remain underutilized due to customers preferring cash or merchants not actively offering the POS payment option. These customer-side barriers are deeply ingrained and require long-term strategies.

"Cybersecurity concerns limit the implementation of certain digital banking features" (BR3, M=4.09) was also seen as a 'High Importance/Agreement' barrier. This finding presents an interesting juxtaposition with the high staff confidence expressed in CPA's current cybersecurity measures (TI7, M=4.41, from Table 3.5). This suggests a nuanced perception: while employees may trust the security of existing systems for their current functionalities, broader or more abstract cybersecurity concerns might act as a deterrent when considering the implementation of new or more advanced digital banking features, perhaps those involving more open architectures or greater data sharing. For instance, staff might feel CPA's current e-banking is secure for today's functions, but if the bank considers more complex services like open banking APIs or advanced AI-driven tools, new cybersecurity questions could arise, showing a sophisticated

awareness rather than a simple contradiction. The Relizane Branch Director, however, provided a reassuring perspective on current operational resilience, stating that technical disruptions are rare due to robust backup systems (fiber optic and ADSL internet connections) and continuous central monitoring from Algiers, ensuring quick resolution of any issues that arise. This suggests that while general cybersecurity apprehensions might exist as a barrier to future innovations, the current operational systems are perceived as resilient by local management.

Finally, "Customer preferences for cash and face-to-face transactions limit digital banking adoption" (BR1, M=4.03) was also identified as a 'High Importance/Agreement' barrier. This reflects the deeply ingrained cash-centric culture in Algeria, a factor also noted by Meziane and Bouguetaia (2023) in their study of Algerian banks. The Branch Director echoed this sentiment vividly, stating that "a cash-based culture still prevails, particularly among older individuals," and that even when POS terminals are available, customers sometimes prefer cash, or merchants do not proactively encourage POS payments.

The consistently high ratings across all four barrier items underscore the multifaceted challenges that CPA and the broader Algerian banking sector face in their digital transformation journey. These perceived barriers are critical considerations for strategic planning and for understanding the context in which technological innovations are being implemented and their effects assessed.

3.4.6 Discussion of Hypothesis Testing Results

This section delves into the interpretation of the inferential statistical analyses conducted to test the study's hypotheses. The findings are discussed in relation to the main and sub-research questions, connecting them to the descriptive statistics, qualitative insights from the Relizane Branch Director, Crédit Populaire d'Algérie's (CPA) financial and performance data, and the broader literature.

3.4.6.1 Impact of Technological Innovation on Overall Efficiency (H₀₁)

The primary null hypothesis (H01: Technological innovation has no significant effect on the overall perceived efficiency of CPA) was **rejected**. The regression analysis (Table 3.14) yielded a statistically significant result ($R=.382$, $R^2=.146$, $p=.026$). This outcome indicates that technological innovation, as perceived by CPA employees from both operational (Relizane branch) and strategic (Directorate of Marketing and Communication) units, is a significant positive contributor to the bank's overall perceived efficiency.

The coefficient of determination ($R^2=.146$) suggests that technological innovation explains approximately 14.6% of the variance in perceived overall efficiency. While this figure represents a moderate contribution, it is nonetheless noteworthy and statistically significant. It implies that the bank's strategic emphasis on technological advancement, evidenced by its investments and product rollouts, is yielding tangible and recognized benefits in terms of perceived operational effectiveness. This finding strongly aligns with the general consensus in the banking literature, which consistently suggests a positive relationship between technology adoption and various measures of bank performance and efficiency. For instance, studies such as Lee et al. (2021) on Chinese banks and Wang et al. (2021) focusing on total factor productivity have reported discernible positive effects of technology on banking operations. More specifically relevant to the Algerian context, this result lends empirical support to the conclusions of Meziane and Bouguetaia (2023), who found that financial technology positively influences overall bank performance in Algeria. The significant result for overall efficiency, even if some specific internal dimensions are not statistically significant in this study, suggests a cumulative or holistic positive perception. Employees may feel that even if, for example, internal productivity isn't demonstrably higher yet, the combination of better service quality, some resource optimization, and a general feeling of modernization contributes to an improved perception of overall efficiency.

The perception of enhanced overall efficiency is further substantiated by CPA's tangible progress in technological deployment and customer adoption, as indicated by its financial and operational data (Tables 3.12 and 3.13). The bank's increasing investment in payment systems (e.g., from 35.3 million DA in 2021 to 53.5 million DA in 2022) and the consistently growing revenue derived from these systems (from 512 million DA in 2021 to 832 million DA in 2024) demonstrate a clear strategic commitment and positive financial returns accruing from these technological initiatives. Furthermore, the substantial growth in digital service adoption across multiple

indicators provides concrete evidence of the bank's expanding technological footprint and increasing customer engagement with its digital offerings. For example, the number of total domestic CIB cards in circulation grew from 393,736 in 2021 to 587,016 in 2024. Similarly, the count of affiliated web merchants increased nearly fourfold, from 25 in 2021 to 98 in 2024. The expansion of physical infrastructure is also evident, with operational ATMs increasing from 185 in 2022 to 224 in 2024, and POS terminals growing from 10,737 in 2023 to 12,185 in 2024. Digital service subscriptions have also surged: SMS service subscribers more than doubled from 41,609 in 2021 to 106,777 in 2024, and new Mobile CPA subscribers increased from 81,011 in 2022 to 178,221 in 2024. These quantitative indicators of technological advancement and market penetration underpin the employees' perception of improved overall efficiency.

Qualitative insights from the Relizane Branch Director further corroborate this view. He highlighted new digital products such as "Wimpay CPA" for QR code payments and instant transfers, and the "Cpaye+" deferred payment card, emphasizing their role in positioning CPA as an innovator and adapting to client needs, including facilitating remote payments for merchants. Such advancements contribute to a perception of enhanced overall capability and efficiency.

3.4.6.2 Impact of Barriers to Technological Adoption on Overall Efficiency (H₀2)

The study also investigated the impact of perceived obstacles on the bank's efficiency. The second main null hypothesis (H₀2: Barriers to Technological Adoption have no significant effect on the overall efficiency of CPA) was accepted ($R=.054$, $R^2=.003$, $p=.760$, Table 3.15). This indicates that, within this statistical model, perceived barriers to technological adoption did not have a statistically significant effect on the perceived overall efficiency of CPA.

This finding is somewhat counterintuitive, particularly when considered against the descriptive statistics (Table 3.10), which showed that employees rated all four identified barrier items as being of 'High Importance'. These included concerns about the regulatory framework for digital banking requiring further development (BR4, $M=4.47$), limited customer digital literacy and trust issues (BR2, $M=4.44$), cybersecurity concerns limiting certain digital features (BR3, $M=4.09$), and customer preferences for cash and face-to-face transactions (BR1, $M=4.03$). The Relizane

Branch Director also confirmed the persistence of challenges such as a prevailing cash-based culture and the underutilization of POS terminals despite their availability.

Several interpretations can be posited for this non-significant result. Firstly, the barriers identified—such as regulatory aspects, customer digital literacy, and the cash culture—might primarily affect the pace of future technological adoption or the potential ceiling of efficiency gains achievable in the longer term, rather than significantly degrading the efficiency derived from currently implemented technologies as perceived by staff. The regression model for H₀₂ tested the impact of these barriers on current overall efficiency. Secondly, CPA and its employees may have developed effective workarounds or adaptive strategies over time to mitigate the immediate impact of these persistent environmental barriers on their day-to-day operational efficiency. Thirdly, the positive impact of Technological Innovation on Overall Efficiency (as established by the rejection of H₀₁) might be sufficiently strong in the current context to overshadow or statistically mask any negative influence of these barriers in the regression model for overall efficiency. Finally, the "Overall Efficiency" construct, as operationalized through aggregated employee perceptions, might be more sensitive to internal innovation factors and their direct outcomes than to these broader external or environmental barriers.

The non-significant finding for H₀₂ does not imply that these barriers are irrelevant. Rather, it suggests that, for the current level of technological implementation and the way overall efficiency is perceived by this sample, these barriers are not the primary drivers of variance in overall efficiency within this specific model. However, their high perceived importance, as indicated by the descriptive statistics and qualitative feedback, underscores that they remain critical considerations for strategic planning and for unlocking deeper, broader efficiency gains in the future. These barriers may constrain the potential for future advancements more than they actively derail the efficiency derived from existing technological assets.

3.4.6.3 Impact of Technological Innovation on Specific Efficiency Dimensions (H_{0a}, H_{0b}, H_{0c}, H_{0d})

The study further examined the impact of technological innovation on four specific dimensions of operational efficiency, each corresponding to a sub-research question and a sub-hypothesis.

- **H0a: Technological Innovation (TI) → Resource Utilization Efficiency (RU)**

The null hypothesis H0a, suggesting that technological innovation has no significant effect on perceived resource utilization efficiency, was accepted ($p=.186$, Table 3.15).¹ Despite this non-significant regression result, employees, in the descriptive analysis (Table 3.6), generally rated most resource utilization items highly (e.g., RU7 M=4.09; RU9 M=4.00). This discrepancy suggests a potential "Perception-Implementation Gap": employees may perceive individual tools as helpful for specific resource-saving tasks, but these perceptions do not aggregate to a statistically significant effect on overall resource utilization efficiency at an organizational

level, at least within this model. Several factors could explain this. Firstly, cost savings derived from technological investments often exhibit a lag. The initial outlays for acquiring and implementing new technologies, such as CPA's investment in payment systems (Table 3.12), can be substantial and might temporarily mask or offset operational savings in the short term. This aligns with the concept of the "IT productivity paradox," where expected productivity or cost benefits from IT investments are not immediately evident, an observation made by Liao (2023) in a different banking context. Secondly, while employees perceive benefits in specific areas like reduced physical storage needs (RU1, M=3.79) or fewer branch visits for routine transactions (RU2, M=3.79), the effect on deeper, systemic cost reductions might be less evident or slower to materialize. Notably, the item "Digital tools have reduced redundancy in resource allocation across different banking functions" (RU6) received a mean score of 3.53, categorizing its importance as 'Medium'. This suggests that while individual or departmental efficiencies might be recognized, the broader streamlining of resource allocation and elimination of duplication across functions—often a key driver of significant cost savings—may not yet have been fully realized or perceived.

The Relizane Branch Director's comment that the bank's dependence on technology is "moderate" and that an update to the internal information system is "anticipated" suggests an ongoing evolution rather than fully realized resource optimization at this stage. Furthermore, the nature of CPA's recent innovations, such as Wimpay and Cpaye+, as highlighted by the Branch Director, are primarily customer-facing and payment-oriented. While these can indirectly affect resource use (e.g., potentially reducing the need for counter staff for simple payments), their primary effect might be more directly on service quality and revenue generation (as seen in Table 3.12 revenue growth) rather than immediate, drastic internal cost reductions.

- **H0b: Technological Innovation (TI) → Transaction Processing Efficiency (TP)**

The null hypothesis H0b, stating that technological innovation has no significant effect on perceived transaction processing speed, was also accepted ($p=.163$, Table 3.16).¹ This outcome, similar to H0a, contrasts with descriptive data where employees acknowledged improvements in transaction speeds due to specific technologies (e.g., TP8 $M=4.32$ for ATMs; TP1 $M=4.29$ for remote banking platforms).¹ The Relizane Branch Director also confirmed a significant improvement in inter-agency transfer speeds post-2018 due to the "centralization of CPA agencies".¹ Potential explanations for the non-significant regression result include the possibility of bottlenecks persisting within the end-to-end transaction chain. While front-end systems like mobile applications and ATMs might offer faster interactions, the overall transaction processing speed can be constrained by backend systems, interbank network efficiencies, or manual approval steps that have not been fully automated. A critical indicator in this regard is the 'Medium Importance/Agreement' rating assigned to the statement "Digital systems have enabled real-time transaction processing capability" (TP5, $M=3.62$).¹ If true real-time processing is not universally or comprehensively achieved across all transaction types, the speed gains perceived from isolated innovations might not translate into a statistically significant improvement in overall transaction processing speed attributable to the general technological innovation construct. Broader infrastructural limitations within Algeria, as noted by Ouahab and Koudjil (2024) concerning the "lack of technological infrastructure" ¹, could also impose constraints on achieving consistent high-speed processing across the banking system.

Moreover, the Relizane Branch Director's specific mention of the "centralization of CPA agencies" as a key factor in improving inter-branch transfer times points to the effect of a large-scale, specific project. While substantial, the benefits of such targeted initiatives might not be fully captured or predicted by the more general measure of technological innovation used in the survey's regression model.¹

- **H0c: Technological Innovation (TI) → Employee Productivity (EP)**

The null hypothesis H0c, which proposed that technological innovation has no significant effect on perceived employee productivity, was accepted ($p=.118$, Table 3.17).¹ This result emerged despite employees strongly perceiving productivity gains in the descriptive analysis (e.g., EP5 M=4.35 for serving more customers; EP2 M=4.29 for automation allowing focus on value-added tasks).¹ Several factors could contribute to this lack of statistical significance. Employee productivity can be inherently subjective and difficult to quantify objectively through perception data alone. While staff feel more productive with new tools, translating this subjective experience into a statistically significant relationship with the technological innovation construct might require more direct, objective output measures. Additionally, the introduction of new technologies often involves learning curves and periods of adaptation. Initial dips in productivity or slower-than-expected gains are common before the benefits of new systems are fully realized. The Relizane Branch Director's comment that "there haven't been major operational changes at the staff level yet" but an update to the internal information system is "anticipated" suggests that this is an ongoing process of adaptation and optimization.¹ The perceived effectiveness of supporting systems could also play a role. The relatively lower (though still categorized as 'High Importance/Agreement') ratings for "Staff receive sufficient training on new technologies before implementation" (TI6, M=4.00) ¹ and "Performance analytics help staff identify areas for productivity improvement" (EP7, M=3.91) ¹ are noteworthy. If training is not consistently optimal or if tools for performance feedback and data-driven improvement are not fully leveraged, the productivity potential inherent in new technologies might not be maximized across the organization. This aligns with the findings of Obeng and Boachie (2018), who emphasized the critical role of process innovations and adequate support in boosting employee productivity.¹ The non-significant finding for H0c,

despite positive perceptions, could imply that while technology provides the tools, the organizational processes, training regimens, and performance management systems that enable employees to fully leverage these tools for measurable productivity gains might still be maturing or inconsistently applied at CPA. This points to the importance of not just implementing technology, but also investing in the human and organizational capital necessary to make it truly productive.

- **H0d: Technological Innovation (TI) → Service Quality/Customer Experience (SQ)**

In stark contrast to the non-significant findings for the other specific efficiency dimensions, the analysis of the effect of technological innovation on service quality yielded a clear and statistically significant result. The null hypothesis (H0d: Technological innovation has no significant effect on perceived service quality at CPA) was rejected ($R=.414$, $R^2=.172$, $p=.015$, Table 3.18).¹ This is a robust finding, with technological innovation explaining approximately 17.2% of the variance in perceived service quality. This indicates that CPA's technological efforts are most clearly and significantly affecting the customer-facing aspects of its operations, leading to perceived improvements in the quality of services delivered.

This statistical outcome strongly corroborates the overwhelmingly positive descriptive ratings provided by employees for all items related to Service Quality and Customer Experience (SQ) (Table 3.9). For instance, "Electronic notifications (e.g., SMS, email) have improved communication with customers" (SQ3) received a very high mean score of 4.50, and "Customers have positively responded to CPA's digital service offerings" (SQ7) had a mean of 4.47. Other highly-rated aspects included reduced customer wait times (SQ1, $M=4.29$), increased customer access via digital channels (SQ2, $M=4.00$), and 24/7 availability improving convenience (SQ6, $M=4.15$). This finding resonates strongly with existing literature, such as the study by Zouari and Abdelhedi (2021), which found that digitalization significantly enhances customer satisfaction in the Tunisian banking sector. The qualitative data from the Relizane Branch Director further reinforces this. His enthusiasm for new customer-centric digital products like "Wimpay CPA" and "Cpaye+", and his assertion that these offerings position "CPA as one of the leaders in technological innovation in Algeria" directly support the notion that technology is driving service

improvements. Furthermore, the tangible growth in digital subscribers across various platforms, including Mobile CPA, E-banking, and SMS notifications (Table 3.13), provides concrete evidence of increased customer interaction with these service-enhancing technologies, suggesting customer acceptance and appreciation of these innovations. The significant effect on service quality, when other internal efficiencies show non-significant results, is a key pattern. Improvements in service quality—such as faster access to services, 24/7 availability through digital channels, and enhanced communication—are often more immediately apparent and directly experienced by both customers and front-line staff compared to internal, less visible changes in resource utilization metrics or overall employee output figures. When banks innovate in ways that directly touch the customer experience, the benefits are more readily perceived and, potentially, more consistently reported, making them easier to capture statistically. Unlike complex internal cost structures or multifaceted productivity measures, service quality enhancements like a new user-friendly mobile app or faster online service delivery are directly observable and experiential. This could explain why H0d yielded a significant result while H0a, H0b, and H0c did not, especially within the constraints of a relatively small sample size; the effect size for service quality improvements driven by technology might be larger and more consistent across respondents, making it statistically detectable. This pattern—significant positive effects on overall efficiency and service quality, alongside non-significant effects on internal resource utilization, transaction speed, and employee productivity—points towards a "Perception-Implementation Gap". Technology seems to be enhancing the bank's external image and customer interaction points effectively, but its deeper integration to optimize core internal processes may still be an ongoing challenge. It is often easier and quicker to roll out a new customer-facing application than to re-engineer complex, interconnected internal banking processes. The former provides visible benefits quickly, while the latter requires deeper, longer-term organizational change.

3.4.7 Interpreting Findings through Theoretical Lenses (TAM, DOI, RBV)

The empirical results of this study offer valuable insights when viewed through the lenses of established theoretical frameworks: the Resource-Based View (RBV), the Technology Acceptance Model (TAM), and the Diffusion of Innovation (DOI) Theory.

3.4.7.1 Resource-Based View (RBV)

The RBV proposes that firms achieve sustainable competitive advantage through the strategic management of resources and capabilities that are Valuable, Rare, Imperfectly imitable, and Non-substitutable (VRIN). The study's finding that Technological Innovation has a significant positive effect on Overall Perceived Efficiency (H01 rejected) and, particularly, on Perceived Service Quality (H0d rejected) aligns with this perspective. CPA's documented investments in digital platforms, payment systems (Table 3.12), and the resulting growth in digital service adoption (Table 3.13) appear to be functioning as **valuable** resources. These resources are enhancing customer-perceived efficiency and service delivery, thereby potentially contributing to a competitive advantage or at least an improved operational standing in the Algerian market. This is consistent with literature suggesting that superior technological resources can lead to innovative services and operational efficiencies.

However, the RBV is also nuanced by the study's other findings. The non-significant statistical effect of technological innovation on internal efficiency dimensions such as Resource Utilization (H0a accepted), Transaction Processing Speed (H0b accepted), and Employee Productivity (H0c accepted) suggests that the mere possession or acquisition of technological resources does not automatically translate into all forms of efficiency gains. RBV, especially through the concept of **dynamic capabilities**, aimed at optimizing core operational processes from an RBV standpoint. For technology to become a source of sustained advantage in internal operations, the capabilities to make these internal-facing technologies truly valuable, and perhaps rare or inimitable within the local context, need further maturation and strategic cultivation. The

high perceived effect of barriers also suggests that the environment may be hindering the full exploitation of these resources.

3.4.7.2 Technology Acceptance Model (TAM)

TAM explains user acceptance of information systems based on Perceived Usefulness (PU) and Perceived Ease of Use (PEOU). The generally high levels of agreement among CPA staff regarding the positive attributes of implemented technological innovations—such as the reliability of electronic payment systems (TI2, M=4.24), the adequacy of technical infrastructure (TI3, M=4.21), and management's active promotion of innovation (TI4, M=4.15) (Table 3.5)—suggest positive PU and PEOU concerning these technologies from the employees' perspective. The significant positive effect of technological innovation on Service Quality (H0d rejected) could be partly explained by employees finding new systems useful and easy to operate when interacting with customers, thereby leading to improved service delivery. This aligns with applications of TAM in banking that link PU and PEOU to the adoption and effective use of services like internet banking and ATMs.

Nevertheless, the findings also present a challenge or an extension to the traditional scope of TAM. The non-significant statistical effect on Employee Productivity (H0c accepted), despite high descriptive agreement from employees on productivity-enhancing features like the automation of routine tasks (EP2, M=4.29) and the ability to serve more customers per day (EP5, M=4.35) (Table 3.8), is particularly intriguing. TAM primarily focuses on individual behavioral intention and actual system use. While CPA employees might indeed use the technology and perceive it as useful for their individual tasks (indicating acceptance at an individual level, consistent with TAM), this individual-level acceptance and perceived usefulness might not yet have aggregated to statistically significant organizational-level productivity gains as measured in this study. For example, an employee might find a new software tool easy to use and helpful for their specific tasks. However, if that system is not well-integrated with other bank systems, or if outdated paper-based steps still exist elsewhere in the overall workflow, then broader organizational productivity might not improve significantly, even if individuals are satisfied with their specific tool. This observation could point towards TAM's limitations in fully explaining complex organizational efficiency

outcomes, a critique noted in the literature where TAM is sometimes seen as potentially too simplistic or failing to account for the collective and organizational aspects of technology adoption and effect. It seems that while employee acceptance (a key component of TAM) is present, its translation into statistically measurable internal efficiencies (EP, RU, TP) is weak. This suggests that factors beyond individual acceptance—such as the design of organizational workflows, the level of system integration across departments, the effectiveness of training in leveraging these technologies for systemic gains, or even challenges in measuring aggregate productivity—are likely at play and may not be fully captured by TAM alone.

3.4.7.3 Diffusion of Innovation (DOI) Theory

DOI theory provides a framework for understanding how innovations spread through social systems over time, influenced by characteristics of the innovation itself and the characteristics of the adopters. The reported expansion of digital banking services and products by CPA (TII, M=4.35, Table 3.5), coupled with tangible growth in the adoption of domestic and international cards, an increase in the ATM network, and a rising number of e-banking and mobile banking users (Table 3.13), clearly indicates that various technological innovations are diffusing both within the bank (among employees) and among its clientele. The positive effect on Service Quality (H0d rejected) suggests that innovations enhancing customer interaction (e.g., mobile banking applications like "Mobile CPA" and "Wimpay CPA", electronic notifications) possess characteristics favorable to adoption, such as **relative advantage** (perceived as better than traditional alternatives), **compatibility** (consistent with user needs, especially those of younger demographics as noted by the Relizane Branch Director), and **observability** (visible benefits in terms of convenience and speed), as outlined by Rogers. These characteristics likely drive successful adoption and lead to positive outcomes in customer-facing domains.

The non-significant effect on Resource Utilization, Transaction Processing Speed, and Employee Productivity (H0a,H0b,H0c accepted), however, could reflect challenges in the later stages of the diffusion process—specifically, **implementation** and **confirmation**—for internal, process-oriented innovations. While new technologies might be introduced and adopted at a surface level (passing through the knowledge, persuasion, and decision stages of DOI), their full and effective integration into core banking workflows to achieve optimal internal efficiency might be

a slower, more complex process, or could encounter forms of resistance or inertia not fully captured. Organizational characteristics inherent to a large, state-owned bank like CPA, such as its size, structural complexity, established formalization, or even prevailing organizational culture, could influence the rate and ultimate effectiveness of the diffusion of innovations aimed at internal process improvement. Customer-facing innovations often have more direct and visible benefits, potentially leading to faster and more impactful diffusion. In contrast, internal innovations may require more significant shifts in work practices, deeper and more specialized training, and more concerted change management efforts to achieve their full potential.

The strong perception of, such as regulatory hurdles (BR4, M=4.47) and customer resistance to digital channels (BR1, M=4.03; BR2, M=4.44) (Table 3.10), also directly aligns with DOI theory, as these factors act as significant impediments to the broader and deeper diffusion of technological innovations throughout the banking ecosystem. The data suggests that the diffusion of customer-facing innovations at CPA appears more successful in generating measurable positive effects (specifically on service quality) than the diffusion of internal, process-oriented innovations in terms of statistically significant gains in resource utilization, transaction speed, or employee productivity within the current study's model.

CHAPTER 4: CONCLUSION

4.1 Introduction

This concluding chapter serves to synthesize the principal findings of this research. It will start with a summary of the key results, directly addressing the research questions and hypotheses posited at the outset of the study. Subsequently, the chapter will delve into the practical implications of these findings, offering considerations for Crédit Populaire d'Algérie, the broader Algerian banking sector, and national policymakers. In adherence to academic rigor, the limitations in the study's design and execution will be acknowledged, followed by suggestions for future research that could further illuminate the dynamics of technological innovation and banking efficiency in Algeria and similar emerging markets.

4.2 Summary of Study Findings

The empirical investigation into the impact of technological innovations on the efficiency of Crédit Populaire d'Algérie (CPA) yielded several key findings, derived from statistical analysis of survey data, qualitative insights from management, and supporting financial indicators. These findings are summarized below:

4.2.1 Overall Impact of Technological Innovation on Efficiency (H₀₁):

- The study found that technological innovation has a statistically significant positive effect on the overall perceived efficiency of Crédit Populaire d'Algérie. The null hypothesis (H₀₁) stating no significant effect was rejected ($p=.026$), with technological innovation explaining approximately 14.6% of the variance in perceived overall efficiency.
- This primary finding resonates with a substantial body of academic literature that links technological adoption with enhanced bank performance and efficiency globally. It also lends empirical support to CPA's ongoing strategic focus on digitalization, which is evidenced by increasing investments in payment systems (e.g., from 35.3 million DA in 2021 to 53.5 million DA in 2022 for payment systems) and consistent growth in revenue

derived from these systems (from 512 million DA in 2021 to 832 million DA in 2024) and a marked increase in the adoption of digital services such as domestic CIB cards, e-banking, and mobile banking subscriptions. The general positive perception of efficiency among employees, despite a moderate coefficient of determination, suggests that the cumulative effect of various technological initiatives, including new customer-facing products like "Wimpay CPA" and "Cpaye+", contributes to a favorable view of the bank's modernization trajectory.

4.2.2 Impact of Technological Innovation on Specific Efficiency Dimensions:

Service Quality (H_{0d}):

- Technological innovation demonstrated a statistically significant and positive impact on perceived service quality and customer experience at CPA. The null hypothesis (H_{0d}) was rejected ($p=.015$), with technological innovation accounting for approximately 17.2% of the variance in this dimension.
- This was the most robust finding among the specific efficiency dimensions examined. It is strongly supported by descriptive survey data, where employees gave high ratings to improvements such as enhanced customer communication through electronic notifications (mean score of 4.50 for item SQ3), positive customer responses to CPA's digital service offerings (mean of 4.47 for SQ7), and reduced customer wait times (mean of 4.29 for SQ1).
- The Relizane Branch Director's interview further corroborated this, emphasizing the positive reception of new customer-centric digital products, especially among younger clientele, and their role in enhancing service delivery and convenience. This suggests that CPA's investments in technology are yielding their most discernible and impactful results in areas directly touching the customer. This prioritization of customer-facing enhancements is a common strategic approach for banks undergoing digital transformation, as these innovations are often more visible and can provide immediate competitive advantages.

Resource Utilization (H_{0a}), Transaction Processing Speed (H_{0b}), and Employee Productivity (H_{0c}):

- In contrast to the finding on service quality, the regression analyses indicated that technological innovation did *not* have a statistically significant impact on perceived resource utilization efficiency ($p=.186$), transaction processing speed ($p=.163$), or employee productivity ($p=.118$). Consequently, the null hypotheses H_{0a}, H_{0b}, and H_{0c} were accepted.
- This lack of statistical significance is particularly noteworthy because, at a descriptive level, employees generally perceived benefits in these areas. For instance, they agreed that self-service technologies optimized customer service resource distribution (mean of 4.09 for RU7), that ATMs effectively handled basic transactions thereby reducing teller workloads (mean of 4.32 for TP8), and that the automation of routine tasks allowed staff to focus on more value-added activities (mean of 4.29 for EP2).
- This divergence between positive individual perceptions of technological tools and the absence of a statistically significant organizational-level impact on these internal efficiency dimensions points towards a "Perception-Implementation Gap." Employees may find specific tools useful for their individual tasks, leading to personal efficiency gains. However, if these tools are not deeply integrated into redesigned end-to-end organizational workflows, if systemic bottlenecks persist elsewhere, or if training is insufficient to leverage these tools for broader departmental or organizational output, the aggregate statistical impact on efficiency may remain elusive. This suggests that realizing the full potential of technology for internal operations requires more than just tool deployment; it necessitates fundamental process re-engineering and organizational adaptation.

4.2.3 Impact of Barriers to Technological Adoption on Overall Efficiency (H₀₂):

- The study found that perceived barriers to technological adoption—such as an underdeveloped regulatory framework for digital banking, limited customer digital literacy and trust, a strong preference for cash transactions, and cybersecurity concerns related to

new features—did not have a statistically significant effect on the current overall perceived efficiency of CPA. The null hypothesis (Ho2) was accepted ($p=.760$).

- This finding emerged despite employees rating these barriers as highly important (all four barrier items, BR1-BR4, received mean scores indicating 'High Importance'). The Relizane Branch Director also acknowledged the persistence of challenges like the prevailing cash-based culture and the underutilization of Point of Sale (POS) terminals.
- This seemingly counterintuitive result suggests that these significant barriers might be exerting more of a "Latent Drag" on the pace of future technological adoption or the ultimate ceiling of achievable efficiency gains in the long run, rather than actively degrading the efficiency derived from technologies already implemented and adapted within CPA. The bank and its employees may have developed effective operational workarounds or adaptive strategies to mitigate the immediate impact of these persistent environmental challenges on their current efficiency levels. The positive overall impact of innovation might also overshadow the negative influence of barriers in the current statistical model.

4.2.4 Employee Perceptions and Qualitative Insights:

- Overall, CPA employees expressed positive perceptions regarding the bank's technological advancements. They showed strong confidence in the robustness of cybersecurity measures (mean of 4.41 for TI7) and acknowledged the significant expansion of digital services and products (mean of 4.35 for TI1). However, areas such as the sufficiency of staff training on new technologies (mean of 4.00 for TI6) and the competitiveness of CPA's digital services compared to other banks in the Algerian market (mean of 4.00 for TI8) were rated slightly lower, albeit still in the 'High Importance' category, indicating room for improvement.
- The interview with the Relizane Branch Director provided rich contextual insights, confirming increased customer utilization of digital channels for routine transactions, the

positive impact of specific innovations like "Wimpay CPA" and the centralization of agency systems which improved inter-branch transfer times, and the bank's ongoing efforts to adapt its technological offerings to meet evolving client needs. Simultaneously, the Director highlighted persistent challenges, notably the cash-centric economy and difficulties in promoting widespread POS terminal usage. These qualitative data points help to explain and add depth to the quantitative survey findings.

4.2.5 Theoretical Underpinnings:

- The study's findings were interpreted through the theoretical lenses of the Technology Acceptance Model (TAM), Diffusion of Innovation (DOI) Theory, and the Resource-Based View (RBV). The results suggest that while individual employee acceptance of technology (TAM) and the diffusion of customer-facing innovations (DOI) are evident at CPA (particularly for service quality enhancements), the development of deeper, inimitable organizational capabilities (RBV) required to fully leverage technology for optimizing internal efficiencies (resource utilization, transaction processing, employee productivity) is an ongoing and more complex process. The high perceived effect of barriers further complicates this, hindering effective diffusion and resource exploitation. This theoretical framing helps to understand why certain efficiency outcomes, particularly those related to external service quality, are more readily achieved than others focused on internal operational optimization.

4.3 Practical Implications

The findings of this thesis carry several practical implications for Crédit Populaire d'Algérie (CPA), the wider Algerian banking sector, and national policymakers and regulators. These are aimed at enhancing the effectiveness of technological innovation in driving banking efficiency and supporting the nation's digital transformation agenda.

For Crédit Populaire d'Algérie (CPA):

- **Capitalize on Service Quality Success:** The statistically significant positive effect of technological innovation on service quality is a key strength that CPA should actively build upon. This indicates that customer-facing technologies are well-received and are enhancing the bank's value proposition. CPA should continue to invest in and promote these innovations, such as user-friendly mobile applications (like "Mobile CPA" and "Wimpay CPA"), secure online banking platforms, and efficient electronic notification systems. The high positive customer response to digital offerings (mean of 4.47 for SQ7, Table 3.9) provides a strong foundation for introducing more advanced and personalized digital services, potentially solidifying CPA's competitive position in the Algerian market, an area where employees perceived some room for improvement (TI8, M=4.00, Table 3.5).
- **Address the Internal Efficiency Gap (Resource Utilization, Transaction Processing, Employee Productivity):** The non-significant statistical effect of technological innovation on resource utilization, transaction processing speed, and employee productivity (H0a,H0 b,H0c accepted), despite positive employee perceptions of specific tools, is a critical area for attention. This "Perception-Implementation Gap" signals that merely deploying new technologies is insufficient; deeper organizational integration and process re-engineering are required to translate individual tool utility into aggregate, measurable efficiency gains. The challenge is not unique to CPA; many organizations struggle with this transition from tool adoption to genuine process transformation, necessitating a focus on roles like business process architects who can bridge IT and operational needs.
 - **Actionable Steps:**
 - CPA should undertake comprehensive reviews of its internal workflows and end-to-end processes. This will help identify systemic bottlenecks or outdated practices that current technologies have not adequately resolved (e.g., the 'Medium' agreement on technology enabling real-time processing, TP5 M=3.62, Table 3.7, or reducing redundancy, RU6 M=3.53, Table 3.6), preventing the realization of expected efficiency gains in these internal areas.
 - Investment in targeted training programs is crucial. These programs should extend beyond basic operational instructions for new tools and focus on how employees can integrate these technologies into redesigned, more efficient work processes, fostering a deeper

understanding of how technology can optimize their roles and contribute to broader organizational goals. This directly addresses the relatively lower rating for the sufficiency of staff training (TI6, M=4.00, Table 3.5).

- The bank should enhance its systems for performance analytics and feedback related to productivity. The relatively lower agreement on performance analytics helping staff identify areas for improvement (EP7, M=3.91, Table 3.8) suggests an opportunity. Providing staff and management with clear, data-driven insights into operational performance can help identify specific areas where technology is underleveraged and guide targeted interventions for process optimization.
- Fostering a culture of continuous improvement is paramount. Employees should be encouraged to provide feedback on technological tools and their integration into work processes, and this feedback should be systematically collected and used to iteratively optimize both the technology and the processes. This involves moving beyond simply deploying technology to actively managing its role in transforming how work is done.
- **Strategic Management of Barriers to Adoption:** Although the identified barriers (regulatory framework, customer digital literacy, cash culture, cybersecurity concerns for new features) did not show a statistically significant effect on current overall perceived efficiency in the specific model for H02, their high perceived importance by employees (all items in Table 3.10 rated 'High') means they cannot be ignored in long-term strategic planning. These barriers likely constrain the pace of future innovation and the ultimate potential of digitalization.
 - **Actionable Steps:**
 - CPA should develop and implement targeted initiatives to improve customer digital literacy and build greater trust in digital banking channels, addressing the concerns highlighted by the high mean for BR2 (M=4.44, Table 3.10). This could involve educational workshops, user-friendly guides, simplified interfaces, and clear, transparent communication about security measures.
 - To counter the underutilization of POS terminals and the persistence of a cash-centric culture (BR1, M=4.03, Table 3.10), as noted by the Relizane Branch Director, CPA could collaborate more closely with merchants. This might involve offering incentives for POS

usage, simplifying onboarding processes for merchants, or launching joint promotional campaigns to encourage both merchant adoption and customer usage of digital payments.

- The bank should proactively engage with regulatory bodies. By sharing its experiences, challenges, and perspectives on the operational effect of the current regulatory environment (BR4, M=4.47, Table 3.10), CPA can contribute to the development of a more agile and enabling regulatory framework for digital banking and FinTech in Algeria. This aligns with calls from experts like Samir and Koudjil (2024) for legislative improvements.

For the Algerian Banking Sector:

- **Lessons in Digital Transformation:** CPA's experience, particularly the uneven progress across different efficiency dimensions (strong gains in service quality versus lagging statistically significant improvements in internal efficiencies like resource utilization, transaction speed, and employee productivity), offers valuable lessons for other Algerian banks, especially state-owned institutions. This pattern—prioritizing visible customer-facing improvements first, followed by the more challenging task of internal process re-engineering and optimization—may be a common trajectory in similar contexts undergoing digital transformation.
- **Importance of a Holistic Approach:** This research underscores that technology investment alone is not enough for achieving comprehensive efficiency gains. Sustainable improvements require parallel and integrated investments in human capital development, comprehensive business process redesign, and effective change management strategies to ensure that employees can fully leverage new technologies and adapt to new ways of working.

For Algerian Policymakers and Regulators:

- **Refine Regulatory Frameworks:** The strong perception among bank employees that the current regulatory framework for digital banking in Algeria requires further development (BR4, M=4.47, Table 3.10) is a critical feedback point that policymakers and regulatory authorities should heed. There is a need to prioritize the creation of agile, clear, and supportive regulations for digital banking, FinTech development, data protection, and cybersecurity. Such frameworks should aim to encourage innovation and healthy

competition while safeguarding financial stability and consumer interests, aligning with expert calls for legislative improvements.

- **Promote Digital Literacy and Trust:** National-level initiatives are essential to enhance digital literacy across the population and to build trust in digital financial services. This would address a key demand-side barrier identified by bank employees (BR2, M=4.44, Table 3.10) and help unlock the full potential of the digital banking services being offered by institutions like CPA. Such efforts could involve public awareness campaigns, the integration of digital financial skills into education curricula, and the promotion of secure digital identity solutions.
- **Support for State-Owned Bank Modernization:** Policymakers should recognize the unique challenges and strategic importance of modernizing large state-owned financial institutions like CPA, which form the backbone of the Algerian financial system. This may involve providing clear mandates for efficiency-driven technological adoption, facilitating access to specialized expertise and international best practices, and ensuring that governance structures support agile decision-making in the context of rapid technological change. Successfully enhancing the internal efficiency of these major banks is key to improving the overall financial sector's capacity to allocate capital effectively and contribute to Algeria's economic diversification and growth objectives, moving beyond solely providing more convenient customer services to achieving deeper operational excellence.

4.4 Limitations and Future Research Directions

This study, while providing valuable insights into the effect of technological innovation on the efficiency of Crédit Populaire d'Algérie, is subject to certain limitations. Acknowledging these limitations is crucial for contextualizing the findings and for identifying productive avenues for future research that can further enrich the understanding of this important domain.

Limitations of the Study:

- **Single Case Study Design:** The research focused exclusively on Crédit Populaire d'Algérie (CPA). While this approach allowed for an in-depth examination within one specific organization, the findings may not be directly generalizable to other banks in Algeria,

particularly private banks or smaller institutions, which may operate under different conditions and possess different strategic priorities or resource capabilities.

- **Sample Size and Composition:** The study's sample size of 34 employees, although providing some statistically significant results (for H01 and H0d) and deemed adequate for the specific units surveyed, is relatively small for making broad generalizations across the entire bank or the Algerian banking sector.
- **Cross-Sectional Data:** The data for this study were collected at a single point in time. This cross-sectional approach provides a snapshot of perceptions and relationships at that moment but limits the ability to definitively infer causality or to track the evolution of technology's effect on efficiency dimensions over an extended period. Lag effects of technological investments, for instance, cannot be adequately captured with this design.
- **Potential Respondent Bias:** As acknowledged in the methodology, the reliance on questionnaires completed by bank staff introduces the potential for certain biases. These could include social desirability bias (respondents providing answers they believe are expected or favorable) or perspectives unduly influenced by their specific roles, individual experiences with technology, or personal attitudes towards technological change.

Future Research Directions:

The limitations of the current study directly inform several promising directions for future research:

- **Longitudinal Studies at CPA and Other Banks:** To overcome the limitations of cross-sectional data, future research should adopt longitudinal designs. Tracking the effect of technological innovations on CPA's efficiency dimensions (and those of other banks) over several years would allow for an analysis of trends, the identification of lag effects of investments, and a more dynamic understanding of how internal efficiencies in resource utilization, transaction processing, and employee productivity evolve post-implementation.
- **Comparative Studies within the Algerian Banking Sector:** Future research should extend the investigation to include a wider range of Algerian banks. Comparative studies encompassing state-owned and private banks, as well as institutions of varying sizes and technological maturity levels, would provide a more comprehensive and nuanced picture of how technological innovation is affecting efficiency across the entire sector. This would

also allow for the identification of factors that differentiate successful technology adoption strategies and outcomes.

- **Impact of Regulatory Evolution:** Algeria's Monetary and Banking Law was updated in 2023, and further regulatory adjustments related to digital finance and FinTech are anticipated. Future research should monitor and analyze the specific effect of these evolving legal and regulatory frameworks on FinTech adoption, bank efficiency, market competition, and financial stability within the Algerian context.

By pursuing these research directions, the academic community can build a more comprehensive, robust, and actionable body of knowledge regarding the multifaceted interplay between technological innovation and banking efficiency in Algeria and other emerging markets. This, in turn, will provide more granular insights to guide the strategic decisions of banking institutions and the policy initiatives of regulatory authorities, ultimately contributing to the development of a more modern, efficient, and inclusive financial system.

BIBLIOGRAPHY

A. Journal Articles

Aderonke, A. A., & Ayo, C. K. (2010). An empirical investigation of the level of users' acceptance of e-banking in Nigeria. *Journal of Internet Banking and Commerce*, 15(1), 1–13.

Al-Somali, S. A., Gholami, R., & Clegg, B. (2009). An investigation into the online banking acceptance in Saudi Arabia. *Technovation*, 29(2), 130–141.

Bagozzi, R. P. (2007). The legacy of the technology acceptance model and a proposal for a paradigm shift. *Journal of the Association for Information Systems*, 8(4), 244–254.

Barney, J. (1991). Firm resources and sustained competitive advantage. *Journal of Management*, 17(1), 99–120.

Benahmed Kafia, et.al,(2024), The Digital Transformation In Algeria's Banking Sector: What Opportunities For The Country's Economy?, Educational Administration:Theory and Practice.30(8), 455 -461

Berger, A. N., Clarke, G. G. R., Cull, R., Klapper, L., & Udell, G. F. (2005). Corporate governance and bank performance: A joint analysis of the static, selection, and dynamic effects of domestic, foreign, and state ownership. *Journal of Banking & Finance*, 29(8–9), 2179–2221.

Boniphace D. Malima & Crispin John Mbogo. (2024). Influence of Customer Relationship Management on Customer Retention in the Banking Sector in Tanzania. *International Journal of Research and Innovation in Social Science*, 8(3), 2728-2741.

Courchane, M., Nickerson, D., & Sullivan, R. J. (2002). Investment in online banking as a real option: Theory and tests. *Journal of Multinational Financial Management*, 12(4-5), 347–363.

Davis, F. D. (1989). Perceived usefulness, perceived ease of use, and user acceptance of information technology. *MIS Quarterly*, 13(3), 319–340.

DeYoung, R., Lang, W. W., & Nolle, D. L. (2007). How the Internet affects output and performance at community banks. *Journal of Banking & Finance*, 31(4), 1033–1060.

Enoruwa, O. K., Onwumere, J. U. J., Igunor, A. E., Ehigie, H. A., & Ezuem, D. M. (2023). Impact of technological innovations on bank performance in selected West African countries (1997-2020). *International Journal of Professional Business Review*, 8(8), e02907.

Evanoff, D. D., & Israilevich, P. R. (1991). Productive efficiency in banking. *Economic Perspectives, Federal Reserve Bank of Chicago*, 15(4), 11–32.

- Frambach, R. T., & Schillewaert, N. (2002). Organizational innovation adoption: A multi-level framework of determinants and opportunities for future research. *Journal of Business Research*, 55(2), 163–176.
- Furst, K., Lang, W. W., & Nolle, D. E. (2002). Internet banking. *Journal of Financial Services Research*, 22(1/2), 95–117.
- Godfrey, P. C., & Hill, C. W. L. (1995). The resource-based view and stakeholder theory: A re-examination of the convergence thesis. *Academy of Management Review*, 20(1), 9–10.
- Huang, S. M., Ou, C. S., Chen, C. M., & Lin, B. (2006). An empirical study of relationship between IT investment and firm performance: A resource-based perspective. *European Journal of Operational Research*, 173(3), 984–999.
- Kou, G., & Lu, Y. (2025). FinTech: A literature review of emerging financial technologies and applications. *Financial Innovation*, 11(1), Article 1.
- Lee, C.-C., Li, Y.-Y., Chang, H.-L., & Hsieh, M.-F. (2021). Does fintech innovation improve bank efficiency? Evidence from China's banking industry. *International Review of Economics & Finance*, 74, 468-483.
- Legris, P., Ingham, J., & Colletette, P. (2003). Why do people use information technology? A critical review of the technology acceptance model. *Information & Management*, 40(3), 191–204.
- Liang, H., Saraf, N., Hu, Q., & Xue, Y. (2007). Assimilation of enterprise systems: The effect of institutional pressures and the mediating role of top management. *MIS Quarterly*, 31(1), 59–87.
- Liao, C.-S. (2023). How does fintech affect bank efficiency in Taiwan? *PLoS ONE*, 18(8), e0289610.
- Lin, B. (2007). Information technology capability and value creation: Evidence from the US banking industry. *Technology in Society*, 29(1), 93–106.
- Manasseh, C. O., Ngong, C. A., Logan, C. S., Ede, K., & Okanya, O. (2025). Financial technology, innovation, and bank performance nexus: Evidence from ECOWAS member countries. *Journal of African Business*. Advance online publication.
- MBAMA, C. I., EZEPUE, P., ALBOUL, L., & BEER, M. (2018). Digital Banking, Customer Experience and Financial Performance: UK Bank Managers' Perceptions. *Journal of Research in Interactive Marketing*, 12(4), 432-451.
- Meziane, M. T., & Bouguetaia, S. (2023). Impact of financial technology on Algerian bank performance. *Journal of Innovations and Sustainability*, 7(4), 07.

Obeng, A. Y., & Boachie, E. (2018). The impact of information technology-technological innovation on the productivity of banking employees in Ghana. *Cogent Business & Management*, 5(1), 1470449.

Oliveira, T., & Martins, M. F. (2011). Literature review of information technology adoption models at firm level. *The Electronic Journal Information Systems Evaluation*, 14(1), 110–121.

Osei, L. K., Cherkasova, Y., & Oware, K. M. (2023). Unlocking the full potential of digital transformation in banking: A bibliometric review and emerging trend. *Future Business Journal*, 9(1), Article 30.

Prakash, N., Singh, S., & Sharma, S. (2021). Technological diffusion, banking efficiency and Solow's paradox: A frontier-based parametric and non-parametric analysis. *Structural Change and Economic Dynamics*, 58, 534–551.

Ray, G., Muhanna, W. A., & Barney, J. B. (2005). Information technology and the performance of the customer service process: A resource-based analysis. *MIS Quarterly*, 29(4), 625–652.

Samir, O., & Mohammed, K. (2024). Digitization of Algerian financial institutions: transformation challenges and security risks. *International Journal of Economic Perspectives*, 18(11), 2200–2229.

Solow, R. M. (1957). Technical change and the aggregate production function. *The Review of Economics and Statistics*, 39(3), 312–320.

Teece, D. J., Pisano, G., & Shuen, A. (1997). Dynamic capabilities and strategic management. *Strategic Management Journal*, 18(7), 509–533.

Wang, Y., Sui, X., & Zhang, Q. (2021). Can fintech improve the efficiency of commercial banks? —An analysis based on big data. *Research in International Business and Finance*, 55, 101338.

Wejnert, B. (2002). Integrating models of diffusion of innovations: A conceptual framework. *Annual Review of Sociology*, 28, 297–326.

Zhong, S., Leng, Z., Peng, S., & Liu, Y. (2021). What explains the operational efficiency of listed commercial banks in China? Evidence from a three-stage DEA-tobit modeling analysis. *PLoS ONE*, 16(12), e0260209.

Zhu, K. (2004). The complementarity of information technology infrastructure and e-commerce capability: A resource-based assessment of their business value. *Journal of Management Information Systems*, 21(1), 167–202.

Zhu, K., & Kraemer, K. L. (2005). Post-adoption variations in usage and value of e-business by organizations: Cross-country evidence from the retail industry. *Information Systems Research*, 16(1), 61–84.

Zouari, G., & Abdelhedi, M. (2021). Customer satisfaction in the digital era: Evidence from Islamic banking. *Journal of Innovation and Entrepreneurship*, 10(1), Article 10.

B. Books and Book Chapters

Helfat, C. E., Finkelstein, S., Mitchell, W., Peteraf, M., Singh, H., Teece, D., & Winter, S. G. (2007). *Dynamic capabilities: Understanding strategic change in organizations*. Blackwell Publishing.

Rogers, E. M. (1962). *Diffusion of innovations*. Free Press.

Rogers, E. M. (1995). *Diffusion of innovations* (4th ed.). Free Press.

Rogers, E. M. (2003). *Diffusion of innovations* (5th ed.). Free Press.

Schumpeter, J. A. (1934). *The theory of economic development: An inquiry into profits, capital, credit, interest, and the business cycle* (R. Opie, Trans.). Harvard University Press. (Original work published 1911)

Schumpeter, J. A. (1942). *Capitalism, socialism, and democracy*. Harper & Brothers.

C. Reports and Working Papers

Banque d'Algérie. (2024). *Rapport Annuel 2023: Evolution Economique et Monétaire*.

Basel Committee on Banking Supervision. (2024, June 7). *Literature review on financial technology and competition for banking services* (BCBS Working Paper No. 43). Bank for International Settlements.

Confederation of British Industry & QinetiQ. (2008). *Excellence in service innovation*.

Crédit Populaire d'Algérie. (2024). *Rapport de Gestion du Conseil d'Administration à son Assemblée Générale Ordinaire Exercice Social 2023*.

Crédit Populaire d'Algérie. (2025). *Synthèse du Rapport de Gestion du Conseil d'Administration à son Assemblée Générale Ordinaire Exercice Social 2024*.

Daley, J., & Matthews, K. (2009). *Efficiency and convergence in the Jamaican banking sector 1998-2007* (Cardiff Economics Working Papers, No. E2009/30). Cardiff Business School, Cardiff University.

International Monetary Fund. (2023). *IMF Staff Completes 2023 Article IV Mission to Algeria*. Press Release No. 23/447.

International Monetary Fund. (2024). *IMF Executive Board Concludes 2023 Article IV Consultation with Algeria*. Press Release No. 24/100.

D. Theses and Dissertations

Linn, S. (2020). *Impact of technological innovation with products and processes on banking in Myanmar* (Doctoral dissertation, University of Southern Queensland).

E. Websites

Crédit Populaire d'Algérie. (n.d.). *Crédit Populaire d'Algérie*. Retrieved May 27, 2025, from <https://www.cpa-bank.dz>

APPENDICES

APPENDIX A : SPSS OUTPUTS

Reliability Statistics

Cronbach's	
Alpha	N of Items
.872	44

Gender

	N	%
Male	13	38.2%
Female	21	61.8%

Age Group

	N	%
20-30 years	5	14.7%
31-40 years	13	38.2%
41-50 years	10	29.4%
51-60 years	6	17.6%

Educational Level

	N	%
High School	3	8.8%
Bachelor's Degree	18	52.9%
Master's Degree	8	23.5%
Professional Certification	1	2.9%

Other	4	11.8%
-------	---	-------

Position

	N	%
Research Analyst	14	41.2%
Head of Department	13	38.2%
Senior Executive	3	8.8%
Client Relationship Manager	1	2.9%
Bank Teller	3	8.8%

Department

	N	%
Customer Service	2	5.9%
Trade Finance	3	8.8%
Credit	5	14.7%
Executive Secretary's Office	2	5.9%
Teller Services	6	17.6%
Internal Audit	2	5.9%
Administrative Services	2	5.9%
Executive Management	3	8.8%
Marketing	2	5.9%
Other	3	8.8%
Communication	2	5.9%
Training	2	5.9%

Experience

	N	%
Less than 1 year	1	2.9%
1-5 years	10	29.4%
6-10 years	7	20.6%
11-15 years	2	5.9%
16-20 years	3	8.8%
More than 20 years	11	32.4%

Descriptive Statistics (Technological innovation)

	N	Mean	Std. Deviation
CPA Bank has significantly expanded its digital banking services and products in the past three years.	34	4.35	.544
The bank's electronic payment systems (Mobile CPA, E-Banking, ATMs) are reliable, secure, and meet customer needs.	34	4.24	.654
CPA provides adequate technical infrastructure and support systems to maintain digital banking operations.	34	4.21	.687
Management actively promotes technological innovation and addresses resistance to change effectively.	34	4.15	.784
Technical support and system maintenance ensure minimal disruption to digital banking services.	34	4.15	.657
Staff receive sufficient training on new technologies before implementation.	34	4.00	1.044
The bank has implemented robust cybersecurity measures to protect digital banking operations.	34	4.41	.557
CPA's digital services are competitive with other banks in the Algerian market.	34	4.00	1.015
Valid N (listwise)	34		

Descriptive Statistics (Resource Utilization)

	N	Mean	Std. Deviation
RU1	34	3.79	1.038
RU2	34	3.79	.978
RU3	34	3.94	.983
RU4	34	3.76	1.103
RU5	34	3.71	.836
RU6	34	3.5	.929
RU7	34	4.09	.753
RU8	34	3.85	.892
RU9	34	4.00	1.015
Valid N (listwise)	34		

Descriptive Statistics (Transaction Processing Speed)

	N	Mean	Std. Deviation
TP1	34	4.29	.579
TP2	34	4.09	.965
TP3	34	3.85	.784
TP4	34	4.18	.758
TP5	34	3.62	1.101
TP6	34	4.00	1.128
TP7	34	3.82	.797
TP8	34	4.32	.912
Valid N (listwise)	34		

Descriptive Statistics (Employee Productivity)

	N	Mean	Std. Deviation
EP1	34	4.06	.919
EP2	34	4.29	.719
EP3	34	4.12	.808
EP4	34	4.24	.699

EP5	34	4.35	.691
EP6	34	4.09	.830
EP7	34	3.91	1.055
Valid N (listwise)	34		

Descriptive Statistics (Service Quality and Customer Experience)

	N	Mean	Std. Deviation
SQ1	34	4.29	.629
SQ2	34	4.00	.778
SQ3	34	4.50	.663
SQ4	34	4.24	.699
SQ5	34	4.26	.618
SQ6	34	4.15	.857
SQ7	34	4.47	.563
SQ8	34	4.09	.866
Valid N (listwise)	34		

Descriptive Statistics (Barriers to Adoption)

	N	Mean	Std. Deviation
BR1	34	4.03	1.058
BR2	34	4.44	.660
BR3	34	4.09	.621
BR4	34	4.47	.788
Valid N (listwise)	34		

Main Hypothesis (1):

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	R Square Change	Change Statistics			Sig. F Change
						F Change	df1	df2	
1	.382 ^a	.146	.119	.35322	.146	5.460	1	32	.026

a. Predictors: (Constant), Technological innovation (mean of T11–T18)

ANOVA^a

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	.681	1	.681	5.460	.026 ^b
	Residual	3.992	32	.125		
	Total	4.674	33			

a. Dependent Variable: Overall efficiency (mean of four dimensions)

b. Predictors: (Constant), Technological innovation (mean of T11–T18)

Coefficients^a

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	2.830	.531		5.326	.000
	Technological innovation (mean of T11–T18)	.295	.126	.382	2.337	.026

a. Dependent Variable: Overall efficiency (mean of four dimensions)

Sub Hypothesis (1):

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	R Square Change	Change Statistics			Sig. F Change
						F Change	df1	df2	
1	.232 ^a	.054	.024	.66414	.054	1.825	1	32	.186

a. Predictors: (Constant), Technological innovation (mean of T11–T18)

ANOVA^a

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	.805	1	.805	1.825	.186 ^b
	Residual	14.115	32	.441		
	Total	14.919	33			

a. Dependent Variable: Resource Utilization (mean of RU1–RU9)

b. Predictors: (Constant), Technological innovation (mean of T11–T18)

Coefficients^a

Model		Unstandardized Coefficients		Standardized	t	Sig.
		B	Std. Error	Coefficients		
1	(Constant)	2.489	.999		2.492	.018
	Technological innovation (mean of T11–T18)	.320	.237	.232	1.351	.186

a. Dependent Variable: Resource Utilization (mean of RU1–RU9)

Sub Hypothesis (2):

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	R Square Change	Change Statistics			Sig. F Change
						F Change	df1	df2	
1	.245 ^a	.060	.031	.43325	.060	2.041	1	32	.163

a. Predictors: (Constant), Technological innovation (mean of T11–T18)

ANOVA^a

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	.383	1	.383	2.041	.163 ^b
	Residual	6.007	32	.188		
	Total	6.390	33			

- a. Dependent Variable: Transaction-processing speed (mean of TP1–TP8)
 b. Predictors: (Constant), Technological innovation (mean of T11–T18)

Coefficients^a

Model		Unstandardized Coefficients		Standardized	t	Sig.
		B	Std. Error	Coefficients Beta		
1	(Constant)	3.097	.652		4.752	.000
	Technological innovation (mean of T11–T18)	.221	.155	.245	1.429	.163

- a. Dependent Variable: Transaction-processing speed (mean of TP1–TP8)

Sub Hypothesis (3):

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	R Square Change	Change Statistics			Sig. F Change
						F Change	df1	df2	
1	.273 ^a	.075	.046	.47597	.075	2.581	1	32	.118

- a. Predictors: (Constant), Technological innovation (mean of T11–T18)

ANOVA^a

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	.585	1	.585	2.581	.118 ^b
	Residual	7.250	32	.227		
	Total	7.834	33			

- a. Dependent Variable: Employee productivity (mean of EP1–EP7)
 b. Predictors: (Constant), Technological innovation (mean of T11–T18)

Coefficients^a

Model		Unstandardized Coefficients		Standardized	t	Sig.
		B	Std. Error	Coefficients Beta		
1	(Constant)	3.008	.716		4.202	.000
	Technological innovation (mean of T11–T18)	.273	.170	.273	1.607	.118

a. Dependent Variable: Employee productivity (mean of EP1–EP7)

Sub Hypothesis (4):

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	R Square Change	Change Statistics			Sig. F Change
						F Change	df1	df2	
1	.414 ^a	.172	.146	.39612	.172	6.636	1	32	.015

a. Predictors: (Constant), Technological innovation (mean of T11–T18)

ANOVA^a

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	1.041	1	1.041	6.636	.015 ^b
	Residual	5.021	32	.157		
	Total	6.063	33			

a. Dependent Variable: Service quality and customer experience (mean of SQ1–SQ8)

b. Predictors: (Constant), Technological innovation (mean of T11–T18)

Coefficients^a

Model		Unstandardized Coefficients		Standardized	t	Sig.
		B	Std. Error	Coefficients Beta		
1	(Constant)	2.725	.596		4.573	.000
	Technological innovation (mean of T11–T18)	.364	.141	.414	2.576	.015

a. Dependent Variable: Service quality and customer experience (mean of SQ1–SQ8)

Main Hypothesis (2):

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	R Square Change	Change Statistics			Sig. F Change
						F Change	df1	df2	
1	.054 ^a	.003	-.028	.38160	.003	.095	1	32	.760

a. Predictors: (Constant), Barriers to adoption (mean of BR1–BR4)

ANOVA^a

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	.014	1	.014	.095	.760 ^b
	Residual	4.660	32	.146		
	Total	4.674	33			

a. Dependent Variable: Overall efficiency (mean of four dimensions)

b. Predictors: (Constant), Barriers to adoption (mean of BR1–BR4)

Coefficients^a

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	3.896	.547		7.117	.000
	Barriers to adoption (mean of BR1–BR4)	.039	.128	.054	.309	.760

a. Dependent Variable: Overall efficiency (mean of four dimensions)

APPENDIX B: SURVEY QUESTIONNAIRE

QUESTIONNAIRE ON THE IMPACT OF TECHNOLOGICAL INNOVATION ON ENHANCING THE EFFICIENCY OF CREDIT POPULAIRE ALGERIE (CPA), RELIZANE BRANCH



جامعة غليزان
RELIZANE UNIVERSITY

UNIVERSITY OF RELIZANE
Department of Economics
Monetary & Financial Economics

Date: _____

Dear Respondent,

I am Sidali Meguenni, a master's student at the University of Relizane, conducting research on "The Impact of Technological Innovations on Enhancing the Efficiency of Algerian Banks: A Case Study of Crédit Populaire d'Algérie, Relizane Branch" as part of my master's degree requirements.

The purpose of this research is to investigate how technological innovations in products and processes influence CPA Bank's operational efficiency. Your insights as a staff member of CPA Bank are very valuable to understanding the practical implications of digital transformation within the Algerian banking context.

Please note that:

- Your participation is entirely voluntary.
- All information collected will remain strictly confidential and used for academic purposes only.
- No individual responses will be identified in the final research report.

I sincerely appreciate your time and contribution to this study. Your participation will significantly enhance our understanding of technological innovation in the Algerian banking sector and provide actionable insights for future developments.

For any questions or concerns regarding this research, please feel free to contact me at **sidalimeguenni@gmail.com** or my supervisor at **k.djallam@univ-relizane.dz**

Thank you for your support.

Sincerely,

SECTION A: DEMOGRAPHIC INFORMATION

Please provide the following information by checking (✓) the appropriate box or writing your response in the provided space.

- 1. Gender:
 - [] Male
 - [] Female
- 2. Age group:
 - [] 20-30 years
 - [] 31-40 years
 - [] 41-50 years
 - [] 51-60 years
 - [] Above 60 years
- 3. Highest educational qualification:
 - [] Secondary/High School
 - [] Bachelor's Degree
 - [] Master's Degree
 - [] Doctorate
 - [] Professional Certification
 - [] Other (Please specify): _____
- 4. Current position at CPA Bank:
 - Kinly state your current position: _____
- 5. Department/Unit:
 - (Please specify): _____
- 6. Years of experience at CPA Bank:
 - [] Less than 1 year
 - [] 1-5 years
 - [] 6-10 years
 - [] 11-15 years
 - [] 16-20 years
 - [] More than 20 years

SECTION B: TECHNOLOGICAL INNOVATION

Please indicate your level of agreement with the following statements regarding technological innovation at CPA Bank using the scale below:

1	2	3	4	5
Strongly Disagree (SD)	Disagree (D)	Neutral (N)	Agree (A)	Strongly Agree (SA)

No.	Statement	SD (1)	D (2)	N (3)	A (4)	SA (5)
1	CPA Bank has significantly expanded its digital banking services and products in the past three years.					
2	The bank's electronic payment systems (Mobile CPA, E-Banking, ATMs) are reliable, secure, and meet customer needs.					
3	CPA provides adequate technical infrastructure and support systems to maintain digital banking operations.					
4	Management actively promotes technological innovation and addresses resistance to change effectively.					
5	Technical support and system maintenance ensure minimal disruption to digital banking services.					
6	Staff receive sufficient training on new technologies before implementation.					
7	The bank has implemented robust cybersecurity measures to protect digital banking operations.					
8	CPA's digital services are competitive with other banks in the Algerian market.					

SECTION C: OPERATIONAL EFFICIENCY

Please indicate your level of agreement with the following statements regarding the impact of technological innovation on operational efficiency at CPA Bank.

C1. Resource Utilization Efficiency

No.	Statement	SD (1)	D (2)	N (3)	A (4)	SA (5)
1	Technological innovations have reduced the physical storage space needed for banking records and documentation.					
2	Digital platforms have decreased the frequency of customers needing to visit branches for routine transactions.					
3	Technological innovations have improved the bank's capacity to handle peak transaction periods without additional resources.					
4	Current digital systems allow the branch to serve more customers without increasing physical infrastructure.					
5	Technology adoption has improved the utilization rate of existing banking equipment and resources.					

6	Digital tools have reduced redundancy in resource allocation across different banking functions.					
7	Self-service technologies have optimized the distribution of customer service resources throughout the day.					
8	Banking technology has enabled more efficient allocation of branch office space for customer service.					
9	Digital documentation systems have enabled more efficient retrieval and use of banking information resources.					

C2. Transaction Processing Efficiency

No.	Statement	SD (1)	D (2)	N (3)	A (4)	SA (5)
1	Remote banking platforms have significantly improved transaction processing speeds.					
2	Automated clearing systems have reduced the time required for check processing.					
3	Electronic payment systems have reduced errors in transaction processing.					
4	Mobile banking has reduced processing time for routine customer transactions.					
5	Digital systems have enabled real-time transaction processing capability.					
6	Card payment processing is faster than traditional cash handling methods.					
7	Digital account opening is significantly faster than paper-based methods.					
8	ATMs effectively handle basic customer transactions that would otherwise increase teller workloads.					

C3. Employee Productivity

No.	Statement	SD (1)	D (2)	N (3)	A (4)	SA (5)
1	Technological innovations have significantly enhanced overall employee productivity at CPA Bank.					
2	Automation of routine tasks allows staff to focus on more value-added activities.					
3	Digital tools have minimized manual data entry and paperwork.					
4	Customer information systems provide easy access to account data, improving service efficiency.					
5	Staff can serve more customers per day due to technological innovations.					

6	Digital workflows have reduced processing bottlenecks in daily operations					
7	Performance analytics help staff identify areas for productivity improvement.					

C4. Service Quality and Customer Experience

No.	Statement	SD (1)	D (2)	N (3)	A (4)	SA (5)
1	Technological innovations have noticeably reduced customer wait times.					
2	Digital channels (mobile/online) have increased customer access to banking services.					
3	Electronic notifications (e.g., SMS, email) have improved communication with customers.					
4	Digital tools provide more personalized service to customers.					
5	Customer complaints related to service delays have decreased with digital adoption.					
6	The 24/7 availability of digital channels has improved customer convenience.					
7	Customers have positively responded to CPA's digital service offerings.					
8	Technology helps staff resolve customer issues more efficiently.					

SECTION D: BARRIERS TO TECHNOLOGICAL ADOPTION

Please indicate your level of agreement with the following statements regarding barriers to technological adoption at CPA Bank.

No.	Statement	SD (1)	D (2)	N (3)	A (4)	SA (5)
1	Customer preferences for cash and face-to-face transactions limit digital banking adoption.					
2	Limited customer digital literacy and trust concerns negatively affect digital service usage.					
3	Cybersecurity concerns limit the implementation of certain digital banking features.					
4	The regulatory framework for digital banking in Algeria requires further development.					

THANK YOU FOR YOUR PARTICIPATION

Your contribution to this research is highly valued and will provide important insights into the impact of technological innovation on banking efficiency in Algeria. If you have any additional comments or observations that you would like to share, please use the space below:

Please return the completed questionnaire to (.....)

For any queries regarding this study or if you would like to receive a summary of the research findings, please contact [sidalimeguenni@gmail.com].

Thank you for your time and valuable input.

APPENDIX C: INTERVIEW GUIDE



Research Project: The Impact of Technological Innovations on Improving the Efficiency of Algerian Banks: A Case Study of Crédit Populaire d'Algérie, Relizane Branch.

Student:

Sidali Meguenni

Master's Student, Department of Economic Sciences, Monetary and Financial Economics
University of Relizane

Email: sidalimeguenni@gmail.com

Research Supervisor:

Dr. Karima Djallam

University of Relizane

Email: k.djallam@univ-relizane.dz

Date: May 18, 2025

Attention: Mr. Director Crédit Populaire d'Algérie (CPA) - Relizane Branch

Subject: Interview Questions for Master's Thesis Research

Important Note: These interview questions have been carefully prepared as part of an academic research project for obtaining a Master's degree. Their development has been guided and supported by a university professor to ensure their relevance and methodological rigor.

Preamble: Mr. Director,

We thank you for kindly granting us your time for this interview. This research aims to understand the impact of technological innovations on the operational efficiency of CPA, with particular interest in the experiences within the Relizane branch. Your insights as Branch Director are valuable, particularly regarding the practical implementation and effects of technologies deployed in your branch.

Please note that we are interested in your direct observations and experiences within this branch, rather than national strategic decisions or efficiency data that may not be directly at your disposal. All responses will be treated with the strictest confidentiality and used solely for academic purposes for this Master's thesis.

We appreciate your contribution to this study.

I. Introduction and Overview of the branch's Technological Environment

1. From your perspective as the head of the Relizane branch, could you describe the most notable technological tools or systems with which your staff and customers interact daily?
2. Thinking about daily operations here in Relizane, how would you describe the branch's typical level of dependence on these technologies for essential banking functions?

II. Perceived Impact of Technology on Branch Operations and Customer Service

1. Based on your observations within this branch, in what ways have specific technological introductions (e.g., new software, ATMs, online service portals) influenced how common banking tasks are managed by your staff?
2. According to your observations, what impact has technology had on the speed or flow of customer transactions in your branch?

III. Staff Adaptation and Operational Experience

1. When new technologies or systems are deployed at the Relizane branch, what is the typical process for familiarizing your staff with these changes?

2. Given the specific environment and clientele of the Relizane branch, are there any particular aspects of the implemented technologies that you find particularly well-suited, or perhaps less suited, to your local operational needs?

IV. Localized Challenges and Observations

1. This research notes that the Algerian banking sector is characterized by a cash-centric economy and, in some regions, by underdeveloped digital infrastructure. From your experience at the Relizane branch, how do these broader factors influence the adoption and effective use of technological innovations by your customers and staff?
2. When the branch encounters technical problems or disruptions with banking systems, what is the typical impact on operations and customer service here in Relizane, and how are these situations generally managed at your level?

V. Final Remarks: Are there any other aspects related to the daily use of technology and its effects on branch operations or customer service here in Relizane that you deem important for my understanding within the scope of this research?

Closing: We thank you once again for your valuable time and insights. Your perspective is crucial for this research.

Sincerely,

Sidali Meguenni

APPENDIX D: CPA FINANCIAL AND PERFORMANCE DATA

Tableau 42 : Evolution des dépenses d'investissement au cours des exercices 2021-2022

U : million DA

Rubriques	2021	2022
Biens immobiliers	927,1	895,8
- Construction :	534,0	653,4
- Etudes	128,9	
- Terrains		
- Investissements en cours	405,1	653,4
- Aménagement	393,1	242,4
- Terrains en concession		
- Batiment en concession		
Matériel automobile	16,9	
Informatique (équipt., études, travaux)	311,8	506,6
Monétique	35,3	53,5
Autres investissements : dont :	174,6	328,1
Matériel de sécurité	114,1	102,9
Appareil de régulation électrique		
Mobilier et matériel de bureau	54,5	208,8
Matériel de télécommunication	1,7	3,2
Matériel d'impression et de composition	0,1	0,2
Enveloppe d'opportunité	301,0	
Total	1 767	1 784

ANNEXE IV : PRINCIPAUX PARAMETRES DE GESTION : Indicateurs d'activité

U : million DA

Rubriques	Réalisation 2023	Exercice 2024			Evolution	
		Objectifs	Réalis.	Tx Réalis. (%)	Montant	%
Production						
1 - Total engagements clientèle (2)+(3)	1 627 916	1 704 600	1 433 964	84	-193 952	-12%
2 - Crédits directs :	1 431 431	1 496 600	1 222 159	82	-209 272	-15%
- Crédits d'exploitation	137 500	163 900	157 718	96	20 218	15%
- Crédits d'investissement (y compris les décotes)	1 009 716	1 059 400	747 480	71	-262 236	-26%
- Créances impayées (nets d'agios)	284 215	273 300	316 961	116	32 746	12%
3- Engagements de garantie d'ordre de la clientèle (hors engagement de financement)	196 485	208 000	211 805	102	15 320	8%
4- Engagements de garantie d'ordre des institutions financières	258 292	272 400	387 656	142	129 364	50%
5- Emplois de marché (solde fin de période)	759 631	778 770	815 380	105	55 749	7%
6 - Emplois de trésorerie (capitaux moyens)	62 225	78 500	69 457	88	7 232	12%
dont: placements hors réserve obligatoire	14 337	23 500	15 696	67	1 359	9%
réserve obligatoire	47 888	55 000	53 761	98	5 873	12%
7 - Opérations de refinancement (capitaux moyens)	248 569	218 120	178 109	82	-70 460	-28%
dont: placements S/marché interbancaire	575	40 000	0	/	-575	-100%
programme special de refinancement	247 994	178 120	178 109	100	-69 885	
8 - Total Prises de participations (en bruts)	23 187	25 875	24 194	94	1 007	4%
9 - Echanges extérieurs (en millions USD)	3 397	3 930	3 905	99	508	15%
10 - Total ressources	1 999 509	2 132 471	1 920 074	90	-79 435	-4%
- Ressources Dinars	1 782 147	1 890 200	1 737 807	92	-44 340	-2%
- Ressources Extérieures	400	271	257	95	-143	-36%
- Dépôts Devises	216 962	242 000	182 010	75	-34 952	-16%
11 - Cartes Monétiques CIB émises (en unité)	740 626	807 000	808 931	100	68 305	9%
12 - Cartes Monétiques CIB Corporate émises (en unité)	67 271	82 500	82 970	101	15 699	23%
13 - Cartes Monétiques VISA émises (en unité)	88 954	97 500	98 848	101	9 894	11%
14 - Cartes Monétiques Mastercard émises (en unité)	732	4 600	3 260	71	2 528	345%
15- Terminaux de paiements Electroniques installés (TPE) (en unité)	10 860	14 500	12 185	84	1 325	12%
16 - Distributeurs Automatiques de Billets (DABs) (en unité)	64	59	72	122	8	13%
17 - Guichet Automatiques de Billets (GABs) (en unité)	145	170	152	89	7	5%
18 - Web Marchands (en unité)	73	120	98	82	25	34%
19 - E-Bankings (abonnés)	41 390	45 000	53 240	118	11 850	29%
20 - Echanges de Données Informatisées (virement)	2 685 601	2 763 400	2 827 886	102	142 285	5%
21 - Virements unitaires (virement)	30 390	38 200	44 456	116	14 066	46%
22- Bancassurance (contrats)	14 423	15 600	13 833	89	-590	-4%

II.7.4 – Produits de l'activité monétiques

Les revenus engrangés par l'activité monétique ont progressé de 16% pour s'établir à plus de 716 millions DA (dont 160 millions DA au titre de l'activité domestique et 556 millions DA pour l'activité internationale), contre 619 millions DA en 2022. Cette performance provient globalement de « l'activité internationale » qui a enregistré une augmentation annuelle de 58 millions DA, pour s'établir à 556 millions contre 498 millions en 2022.



Au titre de l'exercice 2022, les revenus provenant de l'activité monétique représentent 619 millions DA contre 512 millions DA enregistrés au titre de l'exercice 2021.

Cette amélioration s'explique aussi bien par la reprise du service SMS CIB, qui a généré des revenus de l'ordre de 30 millions DA que par l'ouverture totale de l'espace aérien, avec ses retombées sur les revenus des transactions à l'international, qui ont augmenté de 15,27%, pour s'établir à 498 millions DA, contre 432 millions DA en 2021.

Les revenus issus de l'activité monétique s'établissent à 832 millions DA (dont 197 millions DA au titre de l'activité domestique et 635 millions DA pour l'activité et l'acceptation internationale) contre 716 millions DA à fin décembre 2023, soit une croissance de 16%.