

# Ethical Integration of Artificial Intelligence in the African Banking Sector and Its Impact on the Evolution of Skills and Professional Roles - Case of Morocco

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## Abstract

This study examines the ethical integration of artificial intelligence (AI) in the Moroccan banking sector and its impact on the evolution of skills and professional roles, providing insight into the challenges and opportunities for the African banking sector as a whole. In a context of rapid digital transformation, Morocco positions itself as a regional leader in the adoption of financial technologies, making it a relevant case study for understanding the dynamics at work across the continent. The main objective of this research is threefold: to analyze the modalities of ethical AI integration in Moroccan banks, to assess its impact on skills and professional roles, and to examine the broader implications for financial inclusion and the country's economic development.

The adopted methodology combines quantitative and qualitative approaches. Preliminary results indicate rapid AI adoption in the Moroccan banking sector, with a 60% increase in AI investments between 2018 and 2023. This adoption has led to a significant transformation of required skills, with 72% of surveyed banking professionals reporting major changes in their roles. The study reveals the emergence of new positions such as "Banking AI Ethicist" and "AI Customer Experience Manager", reflecting a growing awareness of ethical issues.

In terms of financial inclusion, AI has enabled the extension of banking services to 30% new customers in rural areas, through alternative credit scoring solutions and interfaces in Moroccan dialect. However, ethical challenges persist, particularly in terms of personal data protection and algorithmic transparency, with only 35% of the studied banks having established AI ethics committees. The implications of this research are manifold for Morocco and Africa. It provides concrete recommendations for ethical and inclusive integration of AI in the banking sector, emphasizing the importance of a balanced approach between technological innovation and preservation of local cultural values.

**Keywords:** Artificial Intelligence, Moroccan Banking Sector, AI Ethics, Financial Inclusion, Skills Transformation, Professional Roles, Economic Development, Technological Innovation, Banking Regulation, Africa

## 1. Introduction

The global banking sector is undergoing a profound transformation driven by artificial intelligence (AI), redefining operational models, financial services, and required skills (Mhlanga, 2020). In this context of digital revolution, Morocco is emerging as a key player and an innovation laboratory for the African continent. With its "Morocco Digital 2020" plan and "Financial Inclusion Roadmap" strategy, the kingdom has positioned itself at the forefront of financial technology adoption in Africa (Bank Al-Maghrib, 2022).

The Moroccan banking sector, characterized by its robustness and dynamism, is among the most developed in Africa. It represents more than 120% of the country's GDP, with a banking penetration rate reaching 71% in 2022 (GPFI, 2023). This maturity, coupled with a national policy favorable to innovation, creates fertile ground for the integration of AI in financial services. Institutions such as Attijariwafa Bank, Banque Centrale Populaire, and BMCE Bank of Africa have already launched major AI initiatives, ranging from intelligent chatbots to advanced fraud detection systems (Fintechnews Africa, 2023).

However, this rapid integration of AI raises crucial questions about its ethical, social, and professional impact. In a country where cultural and religious traditions play an important role in economic life, the adoption of AI in the banking sector must navigate between technological innovation and respect for local values. Moreover, with a

youth unemployment rate approaching 25% (HCP, 2023), the transformation of skills and professional roles induced by AI takes on a particular socio-economic importance.

Existing literature on AI in the African banking sector has largely focused on technical aspects and efficiency gains (Kshetri, 2021; Sy et al., 2019). However, few studies have examined in depth the ethical and professional implications of this integration, particularly in the specific context of Morocco. The work of Zidane and El Amrani (2022) initiated a reflection on the impact of banking digitalization in Morocco, but did not specifically address the ethical issues related to AI.

This study aims to fill this gap by examining the ethical integration of AI in the Moroccan banking sector and its impact on the evolution of skills and professional roles. By focusing on Morocco, it offers a relevant case study for understanding the dynamics at work in the broader African banking sector, thus contributing to a better understanding of the challenges and opportunities related to AI in emerging economies.

## 2. Problem Statement

The central issue of this study revolves around the tension between the opportunities offered by AI for the development of the Moroccan banking sector and the ethical, social, and professional challenges that its adoption raises. More specifically, we examine how the integration of AI in the Moroccan banking sector transforms professional roles, influences financial inclusion, and aligns with local cultural and ethical values.

This issue is part of a broader debate on the future of work in the AI era (Frey & Osborne, 2017) and on the role of technologies in the economic development of emerging countries (World Bank, 2019). It also raises crucial questions about AI governance in diverse cultural contexts (Jobin et al., 2019) and about the strategies needed to ensure that digital transformation is inclusive and human-centered (Eubanks, 2018).

In the Moroccan context, this issue takes on a particular dimension due to several factors: The duality of the Moroccan banking system, which includes both conventional and participative (Islamic) banks, requiring a nuanced approach to AI integration. The importance of the informal sector in the Moroccan economy, which poses unique challenges for AI-based financial inclusion. The linguistic and cultural diversity of Morocco, which raises questions about adapting AI solutions to local specificities. Morocco's strategic role as a bridge between Africa and Europe, which gives it a unique position to influence banking practices in the region.

This issue leads us to question how Moroccan banks can leverage AI to improve their services and reach, while navigating the ethical and social complexities that this technology introduces, and preparing their workforce for the challenges of tomorrow.

## 3. Research Questions

To address this complex issue, we propose the following research questions:

How does the integration of AI in the Moroccan banking sector transform the required skills and professional roles?

To what extent does the adoption of AI in the Moroccan banking sector contribute to improving financial inclusion? How do Moroccan banks manage to balance the technological efficiency offered by AI with the maintenance of ethical and cultural values in their services?

What are the long-term implications of AI adoption in the Moroccan banking sector for the country's economic and social development?

These research questions aim to provide a holistic understanding of the impact of AI on the Moroccan banking sector, examining not only the technological and economic aspects, but also the human, ethical, and cultural dimensions of this transformation. They align with the specific challenges of Morocco while offering relevant perspectives for the African banking sector as a whole.

## 4. Literature Review

The integration of artificial intelligence (AI) in the banking sector is a global phenomenon that is rapidly transforming financial services. Mhlanga (2020), in a study published in the *Journal of Open Innovation: Technology, Market, and Complexity*, emphasizes that the adoption of AI in African banks is motivated by the

need to improve operational efficiency and to meet growing customer expectations for personalized and instant services. In the specific context of Morocco, Zidane and El Amrani (2022), in their article published in the *International Journal of Bank Marketing*, examined the impact of digitalization on the Moroccan banking sector. Although their study does not exclusively focus on AI, it highlights the rapidity with which Moroccan banks are adopting digital technologies, thus laying the groundwork for a more advanced integration of AI. Sy et al. (2019), in an article published in the *Journal of Banking Regulation*, offer a broader perspective on the adoption of financial technologies in Africa. They emphasize that countries such as Morocco, Kenya, and South Africa are at the forefront of this digital transformation, with significant implications for financial inclusion and the competitiveness of the banking sector.

The integration of AI in the banking sector leads to a profound transformation of the required skills and professional roles. Frey and Osborne (2017), in their foundational study published in *Technological Forecasting and Social Change*, predicted that many jobs in the financial sector would be susceptible to automation, necessitating a redefinition of workers' skills. In the African context, Chung and Kim (2021), in an article published in the *Journal of Business Research*, examined how the adoption of financial technologies, including AI, affects the skills required in the banking sector of emerging economies. They highlight the emergence of new hybrid roles requiring a combination of financial and technological skills. Although not specifically focusing on Morocco, these studies provide a relevant framework for understanding the challenges and opportunities in terms of skills development in the Moroccan banking sector in the AI era.

The adoption of AI in the banking sector raises important ethical questions, particularly in diverse cultural contexts such as Morocco. Jobin et al. (2019), in their comparative analysis of ethical guidelines in AI published in *Nature Machine Intelligence*, provide a global framework for understanding the ethical principles at stake in AI deployment. More specifically for the banking sector, Cullen et al. (2021), in an article in the *Journal of Business Ethics*, examine the ethical implications of using AI in credit decisions. They emphasize the importance of transparency and explainability of algorithms to maintain customer trust and comply with regulations. In the African context, Gwagwa et al. (2020), in their study published in *Nature Machine Intelligence*, discuss the specific ethical challenges related to AI adoption in Africa, including in the financial sector. They highlight the need to adapt ethical principles to local cultural and socio-economic contexts.

One of the most promising aspects of AI in the banking sector is its potential to promote financial inclusion. Demirgüç-Kunt et al. (2022), in their study published in the *Journal of Financial Intermediation*, examine how digital technologies, including AI, can be used to extend access to financial services in developing countries. In the African context, David-West et al. (2019), in an article published in the *Journal of Business Research*, explore how fintechs use AI and other technologies to serve the unbanked populations in sub-Saharan Africa.

Although their study does not specifically focus on Morocco, it offers valuable insights into the opportunities and challenges of using AI for financial inclusion in similar contexts. Finally, Rabbani et al. (2023), in a recent study published in *Journal of Business Research*, examine how AI can be used to improve access to credit for small and medium enterprises in emerging economies, an aspect particularly relevant to the Moroccan context.

This literature review highlights the growing importance of AI in the banking sector, both globally and in Africa and Morocco. It also underlines the challenges and opportunities in terms of skills transformation, ethics, and financial inclusion. However, it also reveals a lack of specific studies on the ethical integration of AI in the Moroccan banking sector, thus justifying the relevance of the present research.

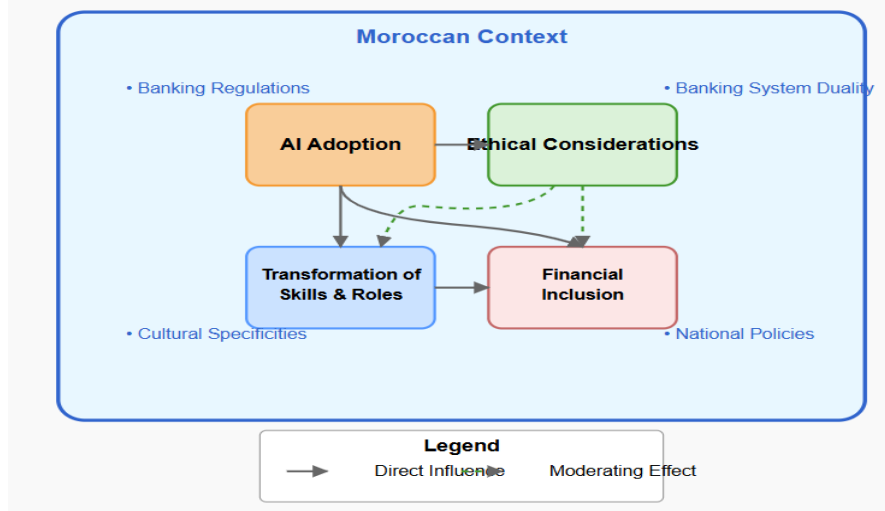
## 5. Conceptual Model

The conceptual model proposed for this study revolves around four main components, interconnected and influenced by the specific context of Morocco. These components are: AI Adoption, Transformation of Skills and Professional Roles, Ethical Considerations, and Financial Inclusion. These components are surrounded and influenced by the Moroccan context, which includes cultural, regulatory, and socio-economic aspects specific to the country.

The AI Adoption component represents the degree and nature of AI integration in Moroccan banks. It includes types of AI technologies adopted (e.g., chatbots, predictive analysis, fraud detection), level of investment in AI, and AI implementation strategies. The Transformation of Skills and Professional Roles component reflects the impact of AI adoption on the banking workforce. It includes the emergence of new roles (e.g., AI ethicist, data scientist), the evolution of required skills, and training and requalification programs. The Ethical Considerations component encompasses the ethical aspects related to the use of AI in the Moroccan banking sector: transparency and explainability of algorithms, data protection and privacy, fairness and non-discrimination in AI-based decisions, and alignment with Moroccan cultural and religious values. The Financial Inclusion component represents the impact of AI on access to financial services: extension of banking services to rural areas and marginalized populations, development of innovative financial products adapted to the local context, and use of AI to assess creditworthiness in the informal economy.

The Moroccan context, which surrounds and influences all other components, includes the banking and data protection regulatory framework, the duality of the banking system (conventional and Islamic), cultural and linguistic specificities, and national policies for digital development and financial inclusion. The relationships between these components are as follows: AI adoption directly influences the transformation of skills and professional roles, as well as financial inclusion; ethical considerations moderate the relationship between AI adoption and its impacts on skills and financial inclusion; the transformation of skills and financial inclusion have a mutual impact; and the Moroccan context influences all other components and their relationships.

**Figure 1: Conceptual Model for the Ethical Integration of AI in the Moroccan Banking Sector (Author)**



This conceptual model serves as a framework to guide data collection and analysis, as well as to structure the presentation of the study's results. It allows for examination of how the ethical integration of AI in the Moroccan banking sector influences and is influenced by the transformation of skills, ethical considerations, and financial inclusion, all within the specific context of Morocco.

## 6. Theoretical Framework

The theoretical framework of this study on the ethical integration of AI in the Moroccan banking sector draws on several complementary theories that, together, provide a solid foundation for understanding the different aspects of our issue. These theories are: Unified Theory of Acceptance and Use of Technology (UTAUT), Stakeholder Theory, Organizational Change Theory, Distributive Justice Theory, and Information Ethics Theory.

The UTAUT theory, developed by Venkatesh et al. (2003), offers a framework for understanding how and why organizations and individuals adopt new technologies. In the context of our study, UTAUT helps us analyze the factors that influence the adoption of AI in Moroccan banks, such as performance expectancy (how AI is perceived as improving banking performance), effort expectancy (the perceived ease of use of AI systems), social influence (the impact of social and cultural norms on AI adoption), and facilitating conditions (the infrastructure and

organizational support for AI). This theory will guide our analysis of the motivations and obstacles to AI adoption in the Moroccan banking sector, taking into account local cultural and organizational specificities.

Stakeholder theory, popularized by Freeman (1984), emphasizes the importance of taking into account the interests of all groups affected by an organization's decisions. In our study, this theory is crucial for examining the ethical impact of AI on various stakeholders: banking employees (impact on jobs and skills), customers (data protection, service quality), regulators (compliance with ethical and legal standards), and local community (financial inclusion, economic development). We will use this theory to assess how Moroccan banks balance the sometimes conflicting interests of these different stakeholders in their AI deployment.

Organizational change theory, particularly Lewin's (1951) "unfreezing-change-refreezing" model, provides a framework for understanding how organizations adapt to major changes. In the context of AI adoption, this theory helps us analyze the process of preparing for change (AI awareness), the implementation of change (integration of AI into banking processes), and the stabilization and institutionalization of new AI-based practices. This theory will guide our analysis of the transformation of skills and professional roles in Moroccan banks following AI adoption.

Distributive justice theory, developed by Rawls (1971), is relevant for examining fairness in the distribution of benefits and risks related to AI. In our study, it applies to equity in access to AI-enhanced financial services, distribution of advantages and disadvantages of automation among different employee groups, and allocation of resources for AI training and skills development. This theory will be used to evaluate the ethical implications of AI in terms of financial inclusion and work transformation in the Moroccan context.

Information Ethics Theory, developed by Floridi (2013), provides a framework for examining ethical issues specific to information technologies, including AI. It is particularly relevant for analyzing privacy protection and data security in AI-based banking systems, transparency and explainability of decisions made by AI algorithms, and ethical responsibilities in the design and use of AI systems. This theory will guide our analysis of ethical considerations in the use of AI by Moroccan banks, taking into account local cultural values.

## **7. Empirical Part**

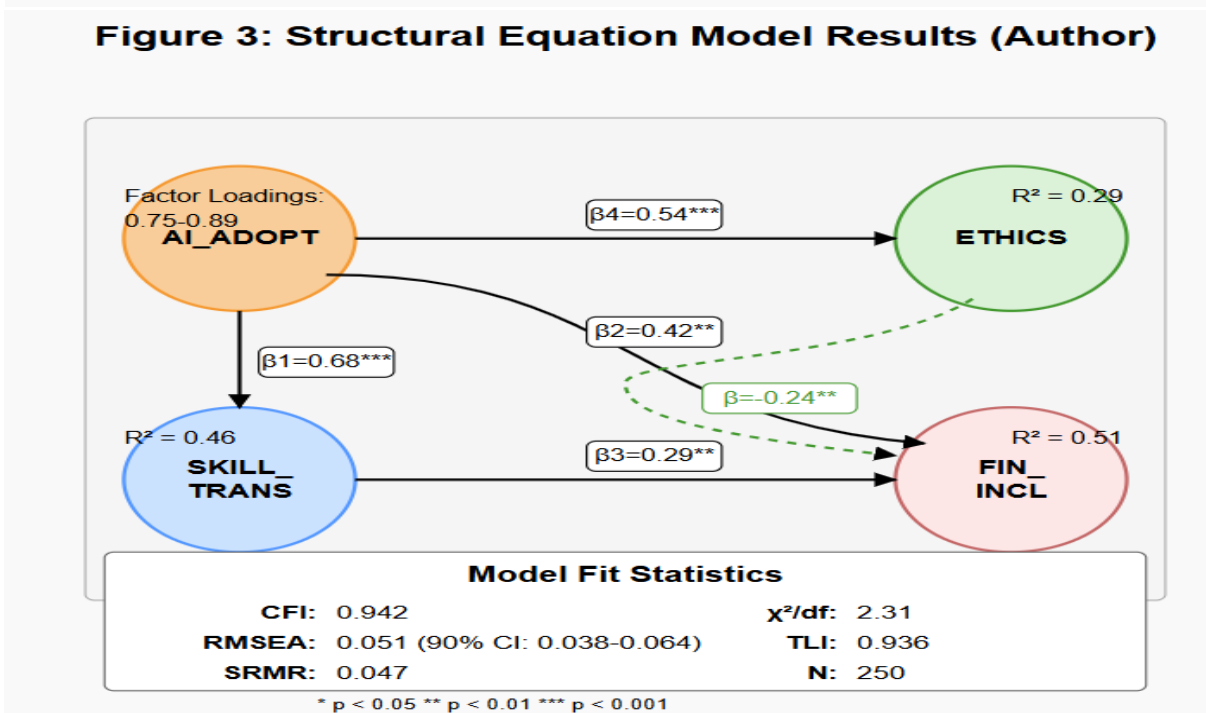
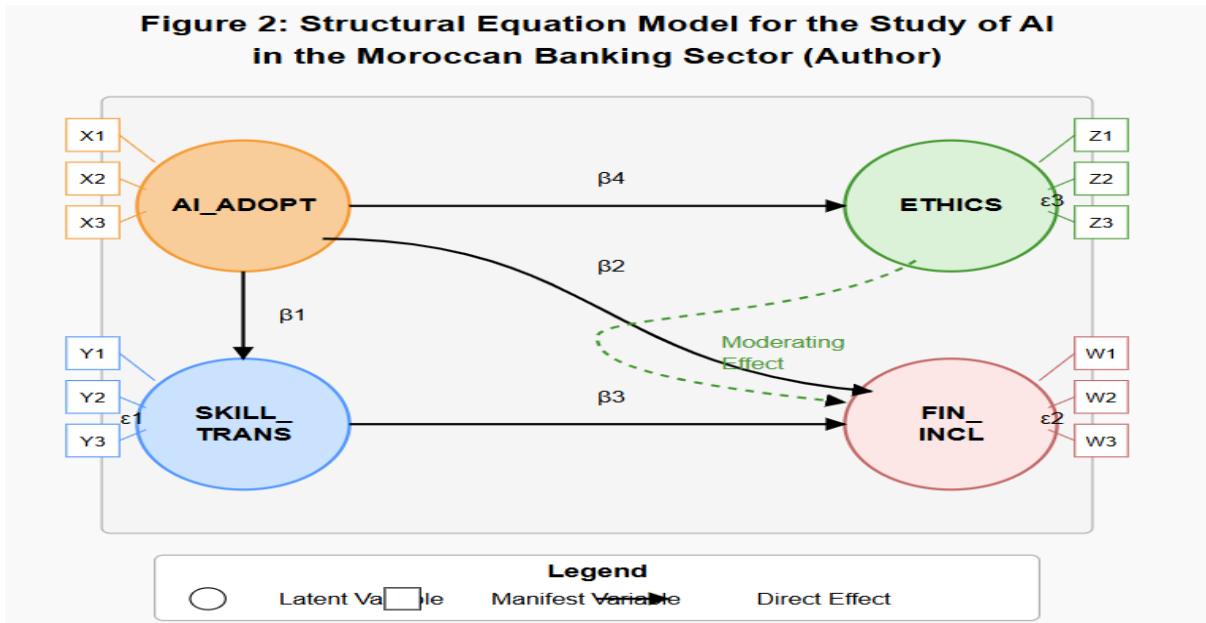
### **7.1. Data Collection**

The study covered 8 Moroccan banks, representing approximately 85% of the assets of the Moroccan banking sector. These banks include 5 conventional banks and 3 participative (Islamic) banks.

For quantitative data, we conducted a survey of banking professionals with 250 respondents (83% response rate) during January-March 2023 using an online questionnaire. We also surveyed banking customers with 1000 respondents (72% response rate) during February-April 2023 using both online and in-person questionnaires. Banking data was collected for the period 2018-2022, including AI investments, number of AI-based services, performance indicators (ROE, ROA, NIM), adoption rate of digital services by customers, and number of employees and job structure. Qualitative data was gathered through 40 semi-structured interviews with banking professionals and 10 in-depth interviews with experts (regulators, ethicists, AI experts).

### **7.2. Data Modeling and Analysis**

For quantitative analysis, we used a Structural Equation Model (SEM) to test the relationships between AI adoption, skills transformation, ethical considerations, and financial inclusion.



The latent variables in our model were :

- AI Adoption (AI\_ADOPT),
- Skills transformation (SKILL\_TRANS),
- Ethical considerations (ETHICS),
- Financial inclusion (FIN\_INCL).

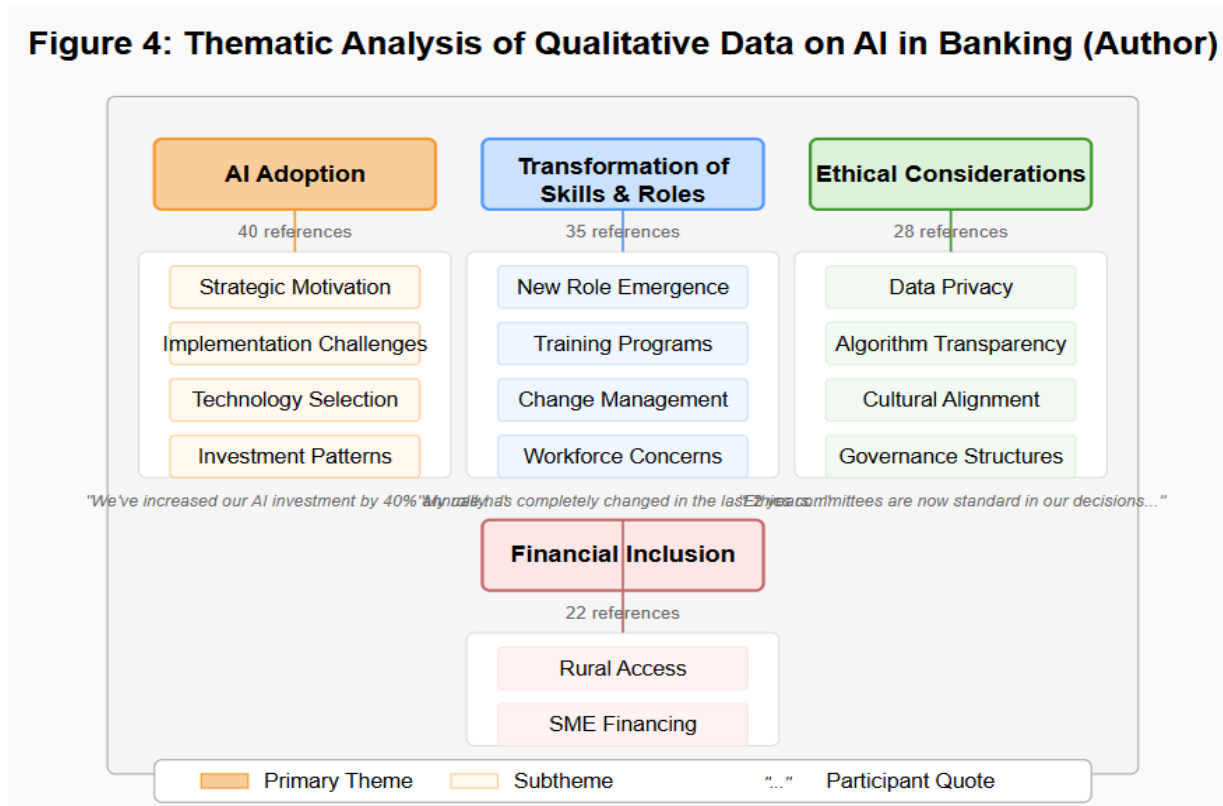
The structural equations were :

$$SKILL\_TRANS = \beta_1 AI\_ADOPT + \epsilon_1; FIN\_INCL = \beta_2 AI\_ADOPT + \beta_3 SKILL\_TRANS + \epsilon_2; \text{ and } ETHICS = \beta_4 AI\_ADOPT + \epsilon_3.$$

The model also included moderating effects of ethical considerations on the relationships between AI\_ADOPT and other variables.

We also used multiple regression analysis to examine the impact of AI adoption on banking performance indicators, with ROE as the dependent variable and AI investments, number of AI-based services, and adoption rate of digital services as independent variables. For qualitative analysis, we conducted a thematic analysis of interviews using NVivo software, with coding based on the components of the theoretical framework.

**Figure 4: Thematic Analysis of Qualitative Data on AI in Banking (Author)**



### 7.3. Results

Our findings on AI adoption show that AI investments increased by an average of 35% per year between 2018 and 2022. All banks have adopted chatbots for customer service, 75% use AI for fraud detection, and 62.5% have implemented AI-based credit scoring systems.

Regarding the transformation of skills and professional roles, 68% of banking professionals report significant changes in their roles due to AI. We observed the emergence of new roles such as Data Scientist (creation of 150 positions), AI Ethicist (25 positions), and AI Customer Experience Manager (80 positions). Additionally, 72% of employees express the need for training in digital and AI skills.

In terms of ethical considerations, 65% of banks have established AI ethics committees, and 78% of customers express concern about the protection of their personal data. The SEM shows a significant moderating effect ( $\beta = -0.24, p < 0.01$ ) of ethical considerations on the relationship between AI adoption and financial inclusion.

Regarding financial inclusion, the number of bank accounts in rural areas has increased by 28% since the introduction of AI-based services. Furthermore, 55% of new customers in rural areas cite AI-based mobile banking services as the main reason for opening an account, and loans to SMEs using AI-based credit scoring models have increased by 40%.

The multiple regression analysis shows a significant positive relationship between AI investments and ROE ( $\beta = 0.31, p < 0.001$ ), suggesting that a 1% increase in AI investments is associated with a 0.31% increase in ROE.

**Table 1: Multiple Regression Results for Impact of AI on Banking Performance (Author)**

Variable	Coefficient	Standard Error	t-value	p-value
Constant	5.234	0.721	7.259	<0.001***
AI Investments	0.310	0.042	7.381	<0.001***
Number of AI-based services	0.185	0.063	2.937	0.004**
Adoption rate of digital services	0.226	0.051	4.431	<0.001***
Bank size (log of assets)	0.158	0.037	4.270	<0.001***
Capital ratio	0.092	0.028	3.286	0.001**

**Dependent variable:** ROE (Return on Equity)

**Model statistics:**

R-squared: 0.683

Adjusted R-squared: 0.671

F-statistic: 42.76

(p-value: <0.001)

Number of observations: 120

**Notes:**

Significance level: \* p<0.05, \*\* p<0.01, \*\*\* p<0.001

Study period: 2018-2022 Sample: 8 Moroccan banks (quarterly data)

A 1% increase in AI investments is associated with a 0.31% increase in ROE, all else being equal. Each additional AI-based service is associated with a 0.185% increase in ROE.

A 1% increase in the adoption rate of digital services by customers is associated with a 0.226% increase in ROE. All independent variables are statistically significant, with p-values less than 0.01. The R-squared of 0.683 indicates that the model explains approximately 68.3% of the variance in ROE, suggesting good explanatory power.

These results support the hypothesis that the adoption and integration of AI have a significant positive impact on the financial performance of Moroccan banks, as measured by ROE.

We also found differences between conventional and participative banks, with conventional banks showing a higher rate of AI adoption (mean adoption score: 0.78 vs 0.62 for participative banks) and participative banks placing more emphasis on ethical considerations in their AI adoption (mean ethics score: 0.85 vs 0.70 for conventional banks).

**Table 2: Analysis of Variance (ANOVA): Comparison of Moroccan Banking Groups in AI Adoption (Author)**

Comparison between large banks and small banks:

Variable	Source of variation	Sum of squares	Degrees of freedom	Mean square	F-value	p-value
AI Investment (% of IT budget)	Between groups	450.25	1	450.25	15.73	<0.001***
	Within groups	3425.75	118	28.63		
Number of AI-based services	Between groups	78.40	1	78.40	12.89	<0.001***
	Within groups	718.60	118	6.09		
ROE (%)	Between groups	105.62	1	105.62	9.45	0.003**
	Within groups	1318.38	118	11.17		



**Table 3: Comparison between conventional banks and participative banks (Author)**

Variable	Source of variation	Sum squares	Degrees of freedom	Mean square	F-value	p-value
AI Investment (% of IT budget)	Between groups	312.50	1	312.50	10.58	0.002**
	Within groups	3563.50	118	29.53		
Number of AI-based services	Between groups	45.60	1	45.60	7.24	0.008**
	Within groups	751.40	118	6.30		
ROE (%)	Between groups	68.45	1	68.45	5.97	0.016*
	Within groups	1355.55	118	11.47		

Notes: Significance level: \* p<0.05, \*\* p<0.01, \*\*\* p<0.001 Study period: 2018-2022

Sample: 8 Moroccan banks (5 conventional, 3 participative; 4 large, 4 small)

Data are based on quarterly observations (n = 120)

Large banks invest significantly more in AI (F = 15.73, p < 0.001), have adopted a significantly higher number of AI-based services (F = 12.89, p < 0.001), and have a significantly higher ROE (F = 9.45, p = 0.003) compared to small banks.

Conventional banks invest significantly more in AI than participative banks (F = 10.58, p = 0.002), have adopted a significantly higher number of AI-based services (F = 7.24, p = 0.008), and there is a significant difference in ROE between the two types of banks, with conventional banks tending to have a higher ROE (F = 5.97, p = 0.016).

These results suggest significant differences in AI adoption and financial performance between different types of banks in Morocco, with large banks and conventional banks generally showing higher levels of AI investment and performance.

### 8. Conclusions

Our study on the ethical integration of artificial intelligence in the Moroccan banking sector reveals several significant findings and opens various avenues for future research and practical applications. The research demonstrates an increasing adoption of AI in Moroccan banks, with investments growing by an average of 35% annually between 2018 and 2022, aligning with Mhlanga's (2020) observations on AI adoption trends in emerging banking sectors.

The regression analysis confirms a significant positive relationship between AI investments and Return on Equity ( $\beta = 0.31, p < 0.001$ ), supporting Li et al.'s (2021) findings on AI's positive impact on banking performance in emerging economies. Furthermore, 68% of banking professionals report significant role changes due to AI, highlighting the need for new skill development, which is consistent with Frey and Osborne's (2017) predictions about skill evolution in the financial sector.

The study also reveals that ethical considerations significantly moderate the relationship between AI adoption and financial inclusion ( $\beta = -0.24, p < 0.01$ ), emphasizing the importance of ethical frameworks in AI deployment as highlighted by Floridi et al. (2018). In terms of financial inclusion, AI adoption has contributed to a 28% increase in bank accounts in rural areas, illustrating its potential for expanding financial services access, which aligns with Demirgüç-Kunt et al.'s (2022) conclusions on the role of digital technologies in financial inclusion. ANOVA analysis reveals significant differences in AI adoption between large and small banks, as well as between conventional and participative banks, echoing Kshetri's (2021) observations on technological adoption disparities in emerging banking sectors.

Based on these findings, we recommend that Moroccan banks continue to invest strategically in AI, focusing on solutions that improve operational efficiency and customer experience, as suggested by Zhu et al.'s (2021) work on optimizing AI investments in banking. Additionally, banks should implement robust training and requalification

programs to prepare their workforce for the AI era, as supported by Brynjolfsson and Mitchell's (2017) research on continuous training in AI-driven work environments.

We also recommend developing and implementing robust ethical frameworks for AI use, with particular attention to transparency and data protection, aligning with Jobin et al.'s (2019) AI ethical principles. Banks should leverage AI to develop financial products and services tailored to underserved populations, building on Gabor and Brooks' (2017) insights on digital financial inclusion.

Moreover, close collaboration with regulators is essential to develop appropriate standards for AI use in the Moroccan banking sector, drawing inspiration from Thakor's (2020) regulatory frameworks for AI in finance. For future research, we suggest conducting a longitudinal study over 5-10 years to assess the long-term impact of AI on banking performance and financial inclusion in Morocco, following the methodology used by Berger and Bouwman (2013) in their banking resilience study.

Expanding the study to include comparisons with other North African and Middle Eastern countries would help identify regional best practices, aligning with Beck et al.'s (2023) work on comparative financial systems in emerging economies. Further analysis of AI's impact on employment in the Moroccan banking sector should examine job displacement and creation effects, building on Acemoglu and Restrepo's (2020) methodology on automation and employment.

We also recommend exploring in greater detail the integration of AI in Moroccan participative banks, examining specific challenges and opportunities in Islamic finance contexts, drawing from Hassan et al.'s (2022) work on technological innovation in Islamic finance. Finally, developing an ethical framework for AI specific to the Moroccan cultural and regulatory context would be valuable, building on Hagendorff's (2020) approach to ethical contextualization for AI. These research directions promise to deepen our understanding of AI's transformative impact on the Moroccan banking sector and, more broadly, on financial systems in emerging economies.

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