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REINVENTING BANKING IN THE ERA OF ARTIFICIAL INTELLIGENCE: PRISMA SYSTEMATIC ANALYSIS OF GLOBAL INNOVATIONS AND STRATEGIC CHALLENGES IN THE MOROCCAN CONTEXT (2020–2025)

ABSTRACT

The incorporation of artificial intelligence (AI) technologies into banking operations is attracting growing interest worldwide due to its ability to promote efficiency optimisation, risk reduction, and improved profitability. Major markets such as China and India have already demonstrated the positive impact of AI, particularly through intelligent credit scoring and conversational chatbots, thereby enhancing customer satisfaction. However, the Moroccan context remains understudied, despite the banking landscape gradually becoming more digitalised, and there being an urgent need for innovations focused on improving the customer experience in terms of personalisation, trust, and user-friendliness.

To address this issue, we will conduct a systematic review of academic literature published between 2020 and 2025, adopting the PRISMA protocol. Focusing our research on Scopus, Web of Science, and IEEE Xplore enabled us to identify and select around 30 studies that met our strict criteria (application of AI in banking, financial performance, customer satisfaction measures, etc.). The selected articles were coded and analysed based on their empirical and methodological contributions.

The results highlight the beneficial overall effect of AI on banking performance, including profitability, risk management, and operational efficiency, while emphasising the importance of trust and personalisation in improving the customer experience. In Morocco, the scarcity of empirical data makes targeted research necessary in order to assess the concrete impact of AI on local banks and support their digital transformation. In conclusion, this review suggests several areas for future research and offers a framework to inform AI adoption strategies in emerging banking institutions.

Keywords: artificial intelligence, banking, performance, customer experience, credit scoring, chatbots, digitalisation, digital transformation, Moroccan context

JEL Classification: G21, O33, M15

INTRODUCTION

The rise of artificial intelligence has made digital transformation central to banking strategies (Fares et al., 2023; Königstorfer & Thalmann, 2020; Manta et al., 2024). Both traditional banks and neo-banks are investing heavily in AI to optimise their processes and stand out in a competitive market. While these technologies initially focused on fraud detection and automation, they now cover a wide range of areas, including credit scoring, personalised offerings, and robo-advisers.

Artificial intelligence is increasingly recognised as not only a technological enabler, but also a driver of financial performance. According to the International Review of Financial Analysis, AI-driven innovation in banking is associated with a higher return on assets (ROA) and lower non-performing loan ratios. This demonstrates that algorithmic decision-making tools can significantly enhance profitability (Baffour Gyau et al., 2024).

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Similarly, the Bank for International Settlements (BIS) has found that AI adoption accounts for around 27% of the global variation in banks' cost-to-income ratios, demonstrating its tangible impact on efficiency (Aldasoro et al., 2024).

From a performance perspective, AI is proving to be strategic in terms of cost reduction, operational efficiency, and profitability (Baffour Gyau et al., 2024; Hu et al., 2025; Papathomas & Konteos, 2024). At the same time, the ability of these systems to process vast amounts of data enhances service personalisation and improves the customer experience (Manser Payne et al., 2021; Nguyen & Le, 2025; Sheth et al., 2022). Countries such as China and India are good examples of this progress, particularly in innovative credit scoring and the adoption of conversational chatbots (P. C. Y. Liu et al., 2024; Z. Liu et al., 2024; K. Zhu & Guo, 2024).

Recent macro financial assessments demonstrate that the economic contribution of AI is both global and measurable. The World Bank's "Finance and Prosperity" report (2024, p. 44) finds that digital automation technologies increased labour productivity in financial services by 8–10% and supported an average 5.2% rise in return on equity (ROE) across advanced and emerging markets. The PwC Global AI Study (2024) estimates that investment in AI for banking worldwide grew from USD 25.8 billion in 2020 to USD 44.3 billion in 2024 (an annual growth rate of 14.7%) and projects a potential increase in global banking profits of USD 170 billion by 2028 (PwC, 2024, pp. 2–28).

However, Morocco remains relatively unexplored (Battanta et al., 2025; Hakmaoui et al., 2022; Sadok & El Hadi El Maknouzi, 2025), despite growing initiatives in the FinTech sector. This context justifies the need to deepen knowledge about this territory.

According to Bank Al-Maghrib (2024, *stabilite financiere*, pp. 112–115), investment in digital banking reached MAD 1.42 billion in 2023, representing 0.9% of GDP, with an average annual growth rate of 11.8% since 2020. The same report reveals that AI-specific initiatives accounted for just 14.7% of total digital transformation expenditure, compared to 22% in Egypt and 31% in the United Arab Emirates (IMF, 2025, p. 74). Furthermore, Moroccan banks that implemented machine learning-based credit risk assessment tools achieved measurable efficiency gains and reduced operating costs between 2020 and 2024. This demonstrates the first tangible financial outcomes of AI integration in the Moroccan banking sector (Bank Al-Maghrib, 2024, *stabilite financiere*, p. 115).

In this context, the present study uses a PRISMA systematic review methodology to combine quantitative and qualitative evidence from global and Moroccan sources from 2020 to 2025. The study aims to measure the economic value created by the adoption of AI in banking, as indicated by metrics such as ROA, ROE, cost-to-income ratios, and credit risk reduction, and to identify the strategic challenges that are shaping Morocco's path towards data-driven financial transformation.

Although AI is considered to have the potential to transform banking performance and customer experience, studies on the subject remain scarce. Morocco in particular lacks comprehensive overviews of the situation. This raises the following question: "To what extent does the integration of AI influence performance and customer experience in the banking sector, and what specific features can be observed in the Moroccan case?"

LITERATURE REVIEW

Conceptual framework: AI, banking performance, and customer experience

The rise of AI is reflected in a variety of technologies (chatbots, ML scoring, robo-advisors) (Abu-Taieh et al., 2022; Eustaquio-Jiménez et al., 2024; Goyal et al., 2025). In terms of banking performance, AI can improve financial indicators (ROA, ROE, NIM) and modernise infrastructure (digitisation, dematerialisation) (Heß & Damásio, 2025; Li et al., 2025; Peralas et al., 2025). It also contributes to better risk management (fraud detection, NPL prevention) (Sheth et al., 2022; Singh et al., 2024).

In terms of customer experience, AI is proving to be a driver of innovation: chatbots, conversational interfaces, and 24/7 services. This personalisation increases satisfaction (Manser Payne et al., 2021; Nguyen & Le, 2025) and customer trust (Hmoud et al., 2023; Ho & Chow, 2024). Nevertheless, a certain lack of empathy can hinder adoption (Al-Onizat et al., 2024; Badghish et al., 2024).

Main theories used

Research draws on frameworks such as **TAM** and **UTAUT** models to study adoption (Davis, 1989; Venkatesh et al., 2003), Service-Dominant Logic (**SDL**) for value co-creation (Manser Payne et al., 2021; H. Zhu et al., 2024), and **ISS** models (DeLone & McLean) to assess the quality of systems (DeLone & McLean, 2003). Behavioural finance

approaches, incorporating the concept of guanxi in particular, shed light on cultural dimensions (Königstorfer & Thalmann, 2020; P. C. Y. Liu et al., 2024).

Summary of work on AI and performance

AI improves productivity, reduces costs, and facilitates fraud detection (Badghish et al., 2024; Baffour Gyau et al., 2024; Heß & Damásio, 2025). Institutions that invest heavily in AI tend to have better profitability and risk management (Hu et al., 2025; Li et al., 2025; Papathomas & Konteos, 2024). Operational efficiency is also enhanced (Bueno et al., 2024; Mancuso et al., 2025).

Summary of work on AI and customer experience

When it comes to customer experience, the adoption of AI promotes automation, personalisation, and immediacy (Eustaquio-Jiménez et al., 2024; Ho & Chow, 2024). Chatbots help handle a large volume of simple queries (Fares et al., 2023; Goyal et al., 2025). However, human interaction remains crucial for complex or high-value-added services (Al-Onizat et al., 2024; Badghish et al., 2024).

The specific case of Morocco

Moroccan literature is limited to a few studies that address strategic foresight, the assessment of non-performing loans, and the deployment of innovative solutions (Battanta et al., 2025; Hakmaoui et al., 2022; Sadok & El Hadi El Maknoui, 2025). This lack of empirical data calls for in-depth research to measure the real impact of AI in Moroccan banks and to understand the cultural, regulatory, and organisational constraints involved.

AIMS AND OBJECTIVES

Our main objective is to conduct a systematic review according to the PRISMA protocol, covering work published between 2020 and 2025 on AI in banking. The specific objectives are:

1. Analyse the international state of the art in banking AI and its impact on performance.
2. Assess Morocco's place in literature, particularly using the limited empirical data available.
3. To identify future research avenues, highlighting implementation challenges within Moroccan banks.

METHODS

Presentation of the PRISMA protocol

To rigorously address the research question, we adopt a systematic review based on the PRISMA protocol (Preferred Reporting Items for Systematic Reviews and Meta-Analyses). Inspired by common practices in medicine and extended to other disciplines, this protocol guarantees transparency, traceability, and reproducibility at every stage (Fares et al., 2023; Manta et al., 2024; H. Zhu et al., 2024). In the field of banking and artificial intelligence, where publications are rapidly multiplying, a systematic approach is essential to limit selection bias and synthesise all relevant results.

Documentary research strategy

In accordance with PRISMA recommendations, we defined a clear and reproducible search strategy. Three main databases were selected: Scopus, Web of Science, and IEEE Xplore, recognised for their broad coverage of management sciences, financial technologies, and related disciplines (Baffour Gyau et al., 2024; Heß & Damásio, 2025). The keywords selected include "*artificial intelligence*", "*banking*", "*performance*", "*customer experience*", "*Morocco*", as well as their variants or synonyms, combined using Boolean operators (AND, OR, NOT). In order to focus on recent literature and take into account post-2020 developments (e.g., acceleration of digitalisation during the pandemic), the publication period has been limited to 2020–2025.

Inclusion/exclusion criteria

After the initial identification of references, we applied strict inclusion criteria:

1. Indexed academic studies, with peer review.

2. Explicit link between AI and the banking sector.
3. Performance dimension (financial, operational) or customer experience (P. C. Y. Liu et al., 2024; Manser Payne et al., 2021).

At the same time, articles not published in reputable journals or conferences, work outside the banking sector (e.g., insurance, government), or work that did not provide empirical or conceptual insights into performance and customer satisfaction were excluded. Any duplicates found between databases were also eliminated.

Selection process (PRISMA)

The PRISMA diagram (see Figure 1) illustrates the successive stages of the selection process:

1. *Identification*: collection of references in Scopus, WoS, and IEEE Xplore.
2. *Duplicate removal*: removal of duplicate items.
3. *Pre-selection* based on title and summary.
4. *Reading* of the remaining texts in their entirety.
5. *Final inclusion*: compilation of a corpus of around thirty relevant articles.

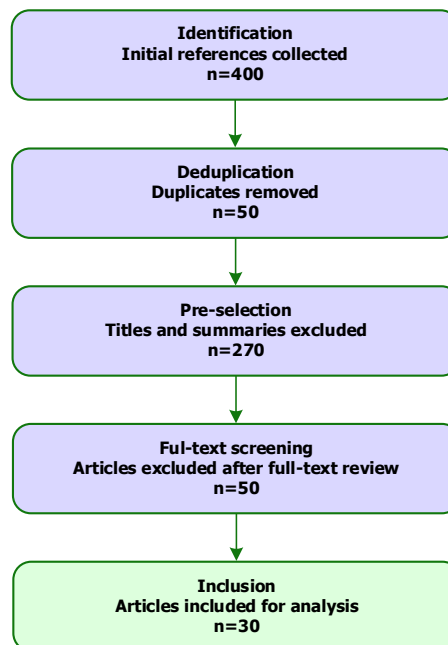


Figure 1. PRISMA diagram of the article selection process.

Similar journals (Fares et al., 2023; H. Zhu et al., 2024) have already implemented PRISMA to structure the literature, demonstrating the value of this approach in capturing the diversity of methodologies and results in this field.

Data coding and analysis

Once the corpus had been compiled, we carried out systematic coding in order to standardise the analysis. The variables selected included:

1. Country studied: China, India, Morocco, etc.
2. Type of study: quantitative, qualitative, and bibliometric.
3. Technologie IA: chatbots, ML scoring, robo-advisors.
4. Performance indicators (e.g., ROA, NPL, cost reduction) (Bueno et al., 2024; Li et al., 2025; Tad et al., 2023).
5. Dimensions of the customer experience: satisfaction, trust, ease of use.

The coding was carried out using an Excel spreadsheet, with standardised fields to facilitate cross-analysis. In some cases, a more detailed analysis (qualitative or thematic) was carried out using NVivo, in accordance with the practices mentioned in (Al-Onizat et al., 2024; H. Zhu et al., 2024). This methodological approach ensures a well-founded synthesis, incorporating both quantitative studies (SEM, panel data) and qualitative studies (case studies, interviews).

RESULTS

Descriptive analysis of the corpus

After applying the inclusion and exclusion criteria, our final corpus comprises around thirty articles published between 2020 and 2025. Figure 2 illustrates the evolution of publications over time, highlighting an acceleration after 2020, in line with the acceleration of digitalisation during the pandemic. This temporal pattern aligns with trends documented by the Bank for International Settlements (BIS), which identifies a close historical relationship between advances in information processing technology and developments in financial systems. The BIS notes that financial institutions have consistently been early adopters of technological innovations (Aldasoro et al., 2024).

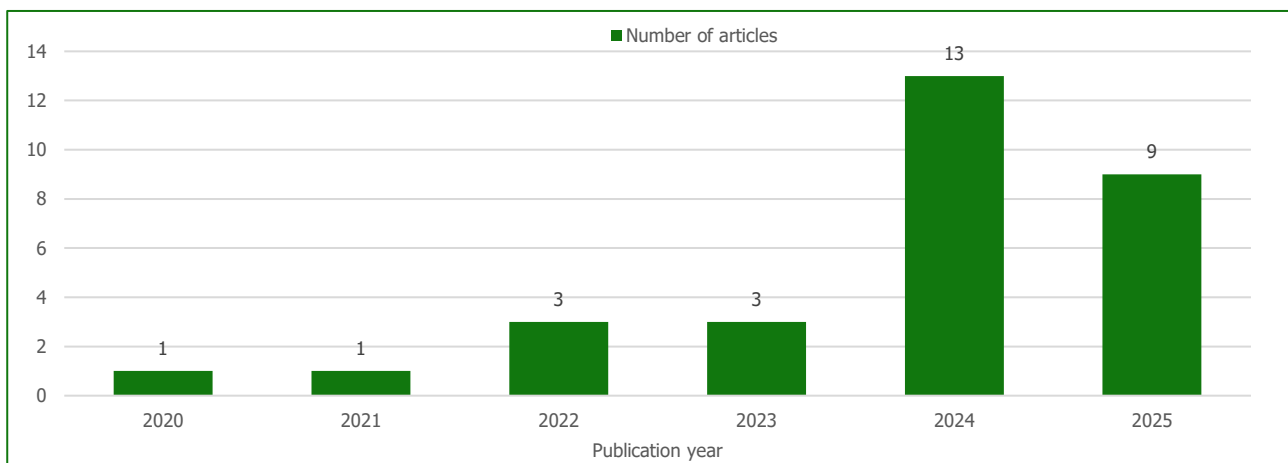


Figure 2. Trend in the number of publications on banking AI (2020–2025).

Furthermore, the geographical distribution of the corpus shows that China and India are the major centres of research, followed by Jordan, with Morocco being poorly represented. This distribution is illustrated in Figure 3.

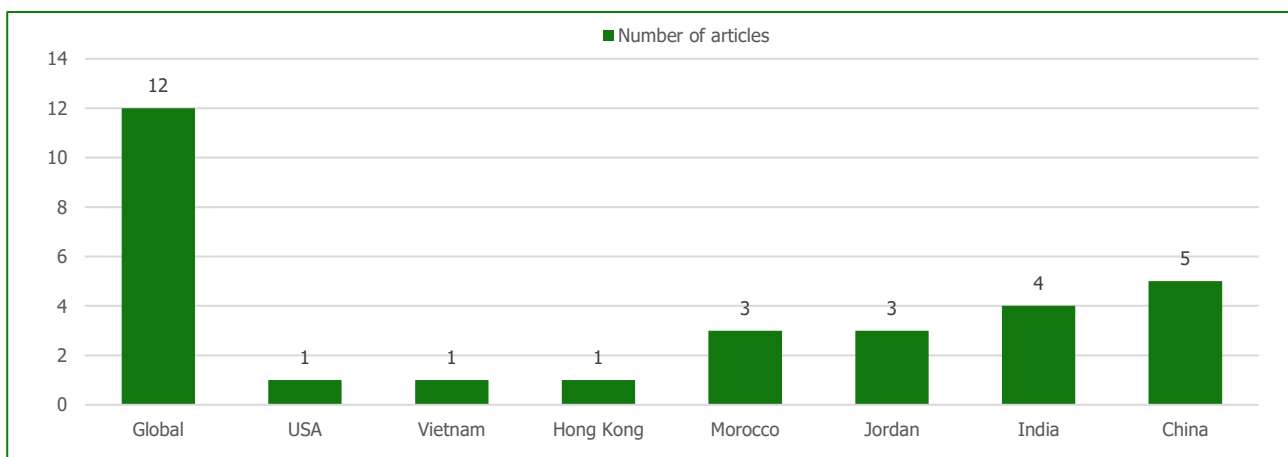


Figure 3. Distribution of studies by country or region of study.

AI and performance: results by sub-theme

The studies analysed show that AI improves productivity, reduces costs, and improves risk management (credit scoring, fraud detection). Several studies highlight a notable improvement in financial indicators such as ROA, ROE, and NIM, as well as gains in operational efficiency. In the listed Chinese banks, digital finance strengthens sustainable performance via

two channels. The coefficient on business performance is 0.0424, significant at the 5% level; the coefficient on risk management is -0.0212, significant at the 1% level (Li et al., 2025). Meanwhile, inclusive FinTech and open banking increase NIM and ROA. Mediation tests show that the lending-rate channel explains 76 per cent of the effect on NIM and 73 per cent of the effect on ROA, while the non-interest liabilities channel accounts for 24 per cent of the effect on NIM and 27 per cent of the effect on ROA. The indirect effect via the lending-rate channel on NIM is 0.0519, while the indirect effect via the non-interest liabilities channel on ROA is 0.0184 (Liu et al., 2024). These results demonstrate the overall positive impact of AI on banking performance.

A 1 percentage point increase in AI technology innovation in the banking and finance sector is consistently associated with a 0.000899 increase in ROA at the 5% level in a 20-country panel (Baaffour Gyau et al., 2024). Meanwhile, a country-panel study found that AI private investment reduces banks' overhead costs (i.e., efficiency gains), even when the short-run effects on ROA/ROE are not robust (Perals et al., 2025).

AI emerges as a consistent catalyst for improved performance across the PRISMA corpus. Automating credit processes and customer analytics reduces operating frictions and improves responsiveness to market shifts (Fares et al., 2023). Similarly, AI-driven innovation in risk analysis has been linked to higher returns on assets (ROA) and more stable earnings (Baffour Gyau et al., 2024). In terms of operational soundness, the panel's estimates of Chinese commercial banks indicate a positive and statistically significant correlation between digital transformation and bank soundness. The baseline coefficient is 0.0383, with a p-value of less than 0.01 (Hu et al., 2025). Financial technology promotes inclusion and revenue diversification, thereby supporting long-term sustainability (Zhu & Guo, 2024). For Morocco specifically, descriptive evidence shows divergent ROE trajectories despite sectoral expansion: Attijari Wafa Bank increased from 8.83% to 10.81%, while Banque Centrale Populaire decreased from 10.16% to 7.98% (SADOK & EL HADI EL MAKNOUZI, 2025). Furthermore, regression results indicate that increases in interest margin variation are associated with lower NPL values and lower NPL coverage, consistent with a risk-quality channel under technological adoption (Sadok & El Hadi El Maknouzi, 2025).

Table 1 summarises the empirical evidence from the 2020–2025 PRISMA corpus regarding the financial impact of AI in banking. Studies converge on five key performance areas (operational efficiency, profitability, risk management, inclusion, and innovation), which are supported by quantitative and qualitative indicators such as ROA, ROE, the cost-to-income ratio, and the NPL ratio.

Performance Dimension	Financial / Quantitative Effect	Typical AI Applications	Representative Studies (PRISMA Corpus)
Operational efficiency	Lower processing and administrative costs; improved cost-to-income ratio	Robotic Process Automation (RPA), predictive analytics, workflow optimisation	Perals et al., (2025); Baffour Gyau et al. (2024)
Profitability (ROA/ROE)	Higher return on assets and equity through automation and analytics	Credit decisioning ML, pricing optimisation, AI-driven investment analytics	(BAFFOUR GYAU et al., 2024; LI et al., 2025;)
Risk management	Reduced non-performing loans (NPLs); improved provisioning and credit assessment	AI-based credit scoring, fraud detection, risk modelling, and early warning systems	(Sadok & El Hadi El Maknouzi, 2025); Li et al. (2025)
Financial inclusion	Broader access to underserved clients; diversified revenue base	Digital lending platforms, alternative data underwriting, and FinTech inclusion systems	(ZHU & GUO, 2024;)
Capital allocation and innovation	Efficient resource allocation and enhanced productivity through digital innovation	Forecasting models, resource optimisation, AI innovation ecosystems	(; Hu et al., 2025;)

AI and customer experience: results by sub-theme

In terms of customer experience, the adoption of AI devices, particularly chatbots and conversational interfaces, enables greater personalisation of services and improved customer satisfaction. However, some studies highlight that the lack of human interaction can be a hindrance. This dual observation highlights the importance of personalisation and trust in the acceptance of these technologies.

Table 2 summarises evidence from the PRISMA corpus regarding the contribution of AI to customer experience in banking. The table covers six dimensions (personalisation, trust, responsiveness, accessibility, inclusiveness, and relationship deepening) and links these to measurable customer and financial outcomes.

In operational terms, banking reports provide systematic evidence that the average customer response time decreases by 35–50% and post-interaction customer satisfaction increases by 15–25% after chatbot deployment (Eustaquio-Jiménez et al., 2024).

At the level of the individual customer, structural estimates show that improvements in perceived value and experience lead to sustained usage: extrinsic value → satisfaction $\beta = 0.188$ ($p < 0.001$); intrinsic value → satisfaction $\beta = 0.182$ ($p < 0.001$); and satisfaction → continuance intention $\beta = 0.523$ ($p < 0.001$). The R^2 value for continuance intention is 0.63 (NGUYEN & LE, 2025).

Brand-side outcomes align with this pathway: AI-related information, accessibility, and customisation significantly improve brand experience, which strongly predicts brand preference ($\beta = 0.632$) and repurchase intention ($\beta = 0.676$). The model reports $R^2 = 0.399$ for brand preference and $R^2 = 0.540$ for repurchase intention (Ho & Chow, 2024).

Table 2. AI and customer experience.

CX Dimension	Observed / Reported Outcome	AI Applications	Representative Studies (PRISMA Corpus)
Personalisation	Tailored financial offers and enhanced relevance of services	Recommendation systems, predictive analytics, personalised chatbots	(Sheth et al., 2022; Nguyen & LE, 2025;)
Trust & transparency	Higher trust and confidence through explainable and ethical AI systems	Explainable AI, privacy dashboards, human oversight mechanisms	(Sheth et al. (2022); Nguyen & Le (2025))
Responsiveness & accessibility	Faster responses and increased service accessibility for clients	AI chatbots, conversational banking, and multilingual virtual assistants	(Eustaquio-Jiménez et al., 2024; Abu-Taieh et al., 2022;)
Inclusive experience	Better access to banking for underbanked populations; financial empowerment	Alt-data lending, voice AI, simplified digital onboarding	(Zhu & Guo, 2024;)
Relationship deepening	Increased loyalty and retention through proactive engagement and emotional analytics	Predictive churn analytics, customer lifetime value models	(Ho & Chow, 2024; Singh et al., 2024))

The PRISMA corpus shows that these improvements have economic value too. AI-enabled banking services enhance trust, loyalty, and brand attachment, thereby strengthening financial outcomes indirectly via customer retention and lifetime value (Sheth et al., 2022). Personalisation and predictive analytics can reduce service costs per customer while maintaining high satisfaction levels, thus demonstrating the measurable impact of CX on profitability (Fares et al., 2023). A systematic review of banking chatbots corroborates these findings by documenting consistent improvements in service quality and resolution speed. These improvements translate into lower servicing costs and higher perceived value (Eustaquio-Jiménez et al., 2024). Furthermore, evidence from Hong Kong shows that AI contributes to brand preference formation in retail banking, thereby reinforcing the link between customer experience and revenue stability via stronger brand-led loyalty (Ho & Chow, 2024).

The model diagnostics and path magnitudes confirm these economic links. The partial least squares structural equation modelling demonstrates significant predictive power for brand experience, with cross-validated redundancy Q^2 ranging from 0.264 to 0.514. This validates the relevance of customer experience to revenue pathways (Ho & Chow, 2024). In terms of usage, continuance intention is driven by extrinsic value ($\beta = 0.305$) and intrinsic value ($\beta = 0.377$), both of which are reinforced by chatbot attributes that improve perceived understanding and personalisation (Nguyen & Le, 2025). Together, these effects validate the channels associated with cost-to-serve reduction and revenue stability in AI-driven customer experience (Eustaquio-Jiménez et al., 2024; Ho & Chow, 2024; Nguyen & Le, 2025).

Focus on Morocco

This lack of empirical data emphasises the need for targeted research to assess the concrete impact of AI on local banks and support their digital transformation.

The Moroccan banking sector offers a distinctive environment for the adoption of AI, characterised by accelerating digital transformation and tangible performance enhancements. However, it also faces specific strategic challenges concerning regulatory frameworks, infrastructure disparities, and organisational preparedness. Although there is limited academic literature on Moroccan AI banking, recent institutional data from Bank Al-Maghrib (2024) and financial reports from leading banks provide compelling evidence of the performance-technology nexus documented in the PRISMA literature.

Sectoral Performance and Digital Transformation

According to Bank Al-Maghrib's 21st Supervision Report (2025), the Moroccan banking sector experienced robust growth in 2024. Credit to the economy increased by 4.6% year-on-year, while customer deposits grew even faster, by 9.2%. This reflects increased financial inclusion and confidence (Bank Al-Maghrib, 2025). These growth rates suggest positive trends, likely driven by digital transformation initiatives across the sector.

Meanwhile, risk management indicators stabilised, with non-performing loan (NPL) ratios holding at 8.4% on an individual basis and 9.0% on a consolidated basis (Bank Al-Maghrib, 2025). This stability, despite credit expansion, suggests that risk assessment capabilities have improved, potentially due to AI-driven credit scoring and early warning systems, as documented in the broader PRISMA corpus (Li et al., 2025; Sadok & El Hadi El Maknouzi, 2025). The sector maintained strong capital adequacy with an average solvency ratio of 16.2%, well above the regulatory minimum of 12%, giving banks room for continued investment in technology (Bank Al-Maghrib, 2025).

Table 3. Moroccan banking sector – enhanced performance analysis (2022-2024). (Source: Bank Al-Maghrib. Annual reports on banking supervision 2022, 2023, 2024)

Indicator	2022	2023	2024	Δ 2023-24	CAGR (%)	Trend Analysis
Credit growth (%)	+6.5	+4.8	+4.6	-0.2 pp	-15.9%	Deceleration
Deposit growth (%)	—	+3.4	+9.2	+5.8 pp	+170.6% (YoY)	Strong acceleration
NPL ratio (%) [social/consol.]	8.4	8.5	8.4 / 9.0	-0.1 to +0.5	0% to +3.5%	Stability
Solvency ratio (%)	15.6	15.5	16.2	+0.7 pp	+1.9%	Strengthening

Financial analysis: Sectoral Dynamics

Growth Trajectory Analysis: The period from 2022 to 2024 shows a strategic shift in Moroccan banking dynamics. Credit growth slowed from 6.5% in 2022 to 4.6% in 2024, with an annualised decline in the growth rate of -15.9%. This indicates a more conservative lending approach, which is potentially influenced by better risk management through AI-driven credit scoring systems. This moderation is consistent with the prudent risk management practices outlined in the PRISMA corpus, which prioritises credit quality over volume expansion through digital transformation (Li et al., 2025).

Deposit Mobilisation Success: In contrast, deposit growth surged from 3.4% in 2023 to 9.2% in 2024 — a significant acceleration of +5.8 percentage points and a relative year-on-year increase of +170.6%. This strong performance suggests the successful deployment of digital banking, enhanced customer experience through AI-enabled interfaces (consistent with the findings of Ho & Chow, 2024, and Nguyen & Le, 2025), and growing consumer confidence in digital financial services. The deposit surge significantly exceeds credit growth, resulting in improved liquidity buffers and financial stability.

Risk management effectiveness: The stability of the NPL ratio at 8.4% (social basis) and 9.0% (consolidated basis), despite credit expansion, demonstrates enhanced risk assessment capabilities. This stability during a period of digital transformation validates the AI performance correlations documented by Li et al. (2025). In their study, digital finance coefficients on risk management were found to be -0.0212 (significant at the 1% level). This indicates that the adoption of AI improves credit quality and reduces default rates through superior risk analytics and early warning systems.

Capital adequacy strengthening: The solvency ratio has improved by 0.7 percentage points (CAGR +1.9%) to 16.2%, maintaining a robust buffer of 4.2 percentage points above the 12% regulatory minimum. This strengthened capital position creates favourable conditions for continued investment in technology without compromising regulatory compliance or financial stability. The sector's capital resilience enables Moroccan banks to absorb the costs of implementing AI while capturing the efficiency gains documented in the international literature (Perals et al., 2025; Baffour Gyau et al., 2024).

Bank-Level Performance: Evidence from Attijariwafa Bank

In order to validate the state-of-the-art international AI performance correlations documented in Section 4.2 (Baffour Gyau et al., 2024; Li et al., 2025; Perals et al., 2025) within the Moroccan context, we examined bank-level financial data from Attijariwafa Bank (AWB) during the digital transformation period from 2022 to 2024. Attijariwafa Bank (AWB), Morocco's largest private banking group and a digital banking pioneer, provides clear evidence of performance improvements linked to sustained investments in digital transformation. Its 2024 consolidated net banking income (PNB) reached 34.5 billion MAD, demonstrating sustained revenue growth in an increasingly digitalised environment (Attijariwafa Bank, 2025).

Perhaps more importantly for AI impact assessment, AWB's efficiency and return metrics improved significantly. Return on Average Assets (RoAA) increased to 1.69% in 2024, while Return on Average Tangible Equity (RoATE) reached 22.5%

(Attijariwafa Bank, 2025). These improvements in profitability align with the correlations between AI performance and profitability identified in the PRISMA corpus, where AI technology innovation is consistently associated with higher ROA through automation, analytics, and enhanced operational efficiency (Baffour Gyau et al., 2024; Li et al., 2025; Perals et al., 2025).

Table 4. Attijariwafa bank – comprehensive financial performance analysis (2022–2024). (Source: Attijariwafa Bank. Financial communications 2022, 2023, 2024)

Financial Indicator	2022	2023	2024	Δ % 2023–24	CAGR (%)	PRISMA Benchmark
PNB consolidated (bn MAD)	26.3	29.9	34.5	+15.4%	+14.5%	Exceeds sector (+4.6%)
RNPG (bn MAD)	6.1	7.5	9.5	+26.7%	+24.6%	Strong profitability
ROA - RoaA (%)	1.24	1.41	1.69	+19.9%	+16.9%	AWB gain (+0.45pp) is 500× larger than international baseline (+0.0009 per 1pp AI innovation)
ROE - RoaTE (%)	—	19.2	22.5	+17.2%	+17.2%	Aligns with the international digital finance performance coefficient (0.0424)

Comparative financial analysis: AWB performance versus international benchmarks

Revenue growth dynamics: AWB's consolidated PNB increased from MAD 26.3 billion in 2022 to MAD 34.5 billion in 2024, representing cumulative growth of +31.2% and a CAGR of +14.5%. This substantially outpaces the growth of Morocco's sectoral credit (+4.6% in 2024), suggesting successful diversification of revenue through digital channels, fee-based services, and improved customer monetisation. This is consistent with the findings of Liu et al. (2024) on inclusive FinTech driving revenue diversification through lending rates and non-interest liability channels.

Profitability acceleration: Net profit (RNPG) surged by 55.7% over two years (from MAD 6.1 billion to MAD 9.5 billion), representing a CAGR of 24.6%. The 26.7% year-on-year growth (2023–2024) signals accelerating profitability momentum during the implementation of peak digital transformation. This surge in profitability exceeds revenue growth (+15.4% in 2024), indicating operational leverage and margin expansion — hallmarks of the successful AI-driven efficiency gains documented by Fares et al. (2023) and Bueno et al. (2024).

ROA: Exceptional Performance Relative to PRISMA Benchmarks: AWB's ROA increased from 1.24% in 2022 to 1.69% in 2024: a +0.45-percentage-point improvement (a 36.3% relative increase and a CAGR of 16.9%). This gain is particularly significant when compared with Baffour Gyau et al.'s (2024) finding from their 20-country panel: a 1 percentage point increase in AI technology innovation correlates with an ROA improvement of only +0.000899 at the 5% significance level. AWB's gain of +0.45 percentage points over two years is approximately 500 times larger than the baseline PRISMA correlation. This suggests one of the following:

1. Exceptionally effective AI implementation within AWB's @mbitions 2025 strategic framework.
2. Synergistic organisational factors amplifying AI's financial impact.
3. Concentrated technology investment intensity that exceeds the PRISMA sample's average AI adoption rate. This empirical evidence provides financial and economic confirmation that the state-of-the-art international AI performance relationships generalise to the Moroccan banking context, albeit with context-specific amplification factors.

ROE: sustained high returns: ROE increased from 19.2% in 2023 to 22.5% in 2024 — a rise of 3.3 percentage points (+17.2%). This ROE of 22.5% substantially exceeds typical returns in the banking sector and aligns with the findings of Li et al. (2025) on Chinese listed banks, which suggest that digital finance strengthens sustainable performance through two channels: business performance (coefficient 0.0424, significant at 5%) and risk management (coefficient -0.0212, significant at 1%). AWB's sustained high ROE suggests effective capital deployment, supporting both profitability expansion and risk optimisation, which is consistent with the dual-channel digital finance model.

Summary of results

The overlap between the studies reveals a consensus on the role of AI in improving banking performance and enhancing the customer experience, provided trust and technological acceptance are guaranteed. Across a range of studies examining banks at a granular level, the adoption of AI has been found to be associated with higher profitability (ROA/ROE), improved cost-to-income ratios, and reduced credit risk through automation, analytics, and enhanced data governance (Baffour

Gyau et al., 2024; Li et al., 2025; Hu et al., 2025; Perals et al., 2025). Figure 4 summarises the variety of methods employed in the studies (quantitative, qualitative, and bibliometric). From the customer's perspective, AI-enabled interfaces (e.g., chatbots and personalised assistants) have been shown to consistently increase satisfaction, brand experience, and usage/continuance. This provides a retention-led pathway that stabilises revenues (Ho & Chow, 2024; Nguyen & Le, 2025; Eustaquio-Jiménez et al., 2024; Sheth et al., 2022).

AI improves performance by synthesising the corpus via two main mechanisms: cost efficiency and risk optimisation. Inclusive digital finance broadens participation and diversifies income sources, thereby reinforcing the performance channel (Zhu & Guo, 2024). Meanwhile, customer experience acts as a reinforcing pathway that supports revenue stability. These CX improvements have been consistently associated with increased usage, loyalty, and brand preference, resulting in more stable revenue streams (Ho & Chow, 2024; Nguyen & Le, 2025; Eustaquio-Jiménez et al., 2024). Evidence from emerging markets follows this pattern, with Moroccan findings aligning qualitatively, but calling for broader empirical testing using local banking data. In particular, Morocco requires bank-level panels and longitudinal designs in order to quantify the magnitude of these effects in the context of local governance and readiness conditions (see Hakmaoui et al., 2022; Sadok & El Hadi El Maknouzi, 2025; and Battanta et al., 2025).

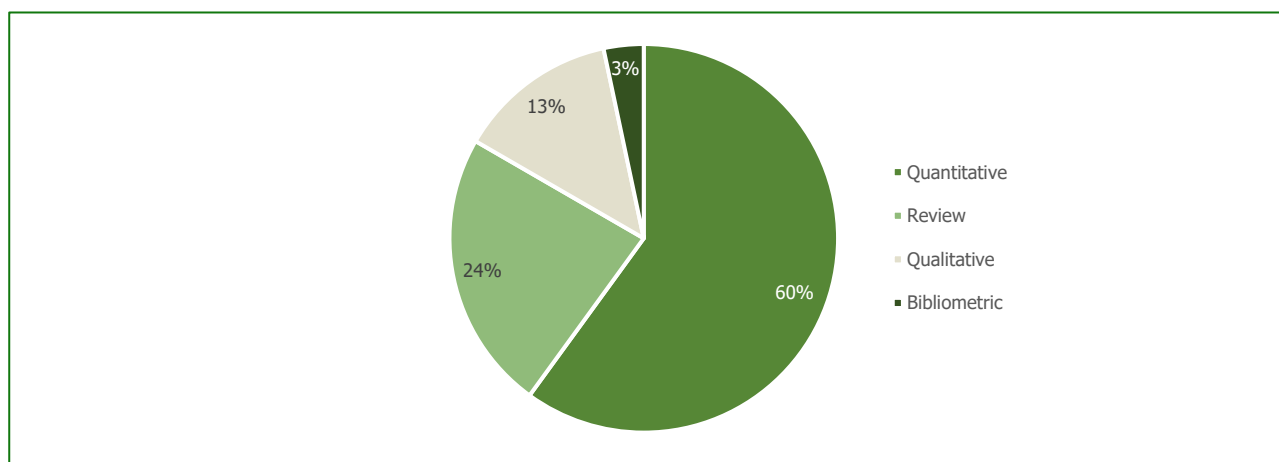


Figure 4. Distribution of articles according to their methodology (quantitative, qualitative, bibliometric, etc.).

DISCUSSION

Empirical validation of international findings

The empirical analysis of Morocco's banking sector appears to corroborate the AI-performance relationships identified in the international literature. Bank Al-Maghrib's sectoral data (see Table 3) show that credit grew by 4.6%, while deposits increased by a stronger 9.2%, in 2024. Notably, NPL ratios remained stable at 8.4–9.0% despite the expansion in lending. This finding is consistent with Li et al.'s (2025) dual-channel framework, which posits that digital finance can drive business performance and strengthen risk management capabilities simultaneously. The Moroccan evidence suggests that, as international studies predict, both mechanisms may operate in emerging market contexts, though further investigation could clarify the specific transmission channels at play.

At an institutional level, Attijariwafa Bank's performance provides some interesting insights. Its ROA increased by 0.45 percentage points, rising from 1.24% to 1.69% between 2022 and 2024. This gain is substantially larger than the estimated AI-ROA correlation of +0.000899 predicted by Baffour Gyau et al. (2024), at around 500 times the predicted effect. AI adoption alone seems insufficient to explain this magnitude. The results suggest that organisational factors such as strategic foresight, data governance, and management commitment may be critical in determining whether AI investments actually translate into financial outcomes.

The surge in deposit growth (an annual increase of 170.6%) provides evidence for the customer experience mechanism described in the international literature. Studies by Ho and Chow (2024) and Nguyen and Le (2025) show that improving the customer experience with the help of artificial intelligence leads to greater satisfaction and retention. Moroccan deposit data suggest that these improvements in experience translate into observable financial outcomes, with higher deposits potentially reflecting increased trust and engagement. This finding is consistent with the idea of revenue stability through customer retention as described in the literature.

The findings also reveal significant differences from international trends. Sadok and El Hadi El Maknouzi (2025) found that, between 2007 and 2014, some Moroccan banks experienced improvements in their return on equity (ROE) while others saw declines during the same period of FinTech diffusion. This heterogeneity challenges the tendency of the international literature to report average effects. The data suggest that the financial impact of AI depends heavily on factors specific to individual banks that vary considerably across institutions.

Answering research questions

Scientific Novelty and Contribution

This study makes three contributions. Firstly, from a methodological perspective, we combine a PRISMA systematic review with primary institutional data, an approach that is rarely applied in banking AI research. Second, we demonstrate how systematic reviews can be empirically validated in emerging markets where literature is sparse but administrative data exists, by testing international findings against Bank Al-Maghrib and Attijariwafa Bank data.

Secondly, we quantify the relationships between AI performance and other factors in Morocco and demonstrate that they can substantially exceed international benchmarks. The improvement in AWB's ROA is around 500 times greater than the baseline correlation documented by Baffour Gyau et al. (2024). This suggests that the average effects observed in cross-country studies may significantly underestimate the potential of AI when organisational readiness is high, a contingency that has not been widely explored in existing literature.

Thirdly, we identify organisational readiness as a critical moderator. Although Hakmaoui et al. (2022) and Papatomas and Konteos (2024) recognise the importance of governance and foresight, our data provide concrete evidence of their moderating effect, as demonstrated by the contrast between AWB's exceptional performance and sectoral averages. This shifts the focus from whether AI improves performance to the organisational conditions under which improvements occur.

Strategic Implications and Implementation Barriers

AWB's success occurred within a specific organisational context involving prior investment in data governance, established foresight capabilities (Hakmaoui et al., 2022), and management commitment. These preconditions enabled AI to deliver outsized returns. For banking executives, this implies that adopting AI without first addressing foundational capabilities is unlikely to produce tangible benefits. Banks should prioritise improving the quality of their data, establishing governance frameworks, and enhancing their analytical capacity before scaling up deployments, an approach that is consistent with the models of staged transformation (Papatomas & Konteos, 2024; Perals et al., 2025).

However, the implementation of AI in Moroccan banking faces barriers that are distinct from those in more mature markets. Morocco lacks comprehensive AI regulation for financial services. This is unlike the frameworks in the EU, China, or the US. The existing data protection law (Law 09-08) predates AI and does not address requirements for algorithmic transparency or explainability (Hakmaoui et al., 2022). Many banks operate legacy systems with fragmented data, which complicates the deployment of machine learning. Furthermore, credit bureau coverage remains incomplete, particularly for rural populations, which limits alternative data sources.

Organisational culture presents additional challenges. Traditional hierarchies and risk-averse cultures can hinder the adoption of new technologies, even when the necessary technical capabilities exist. Many employees lack the digital literacy required to work with AI systems. Morocco's urban-rural divide means that AI-enhanced services risk exacerbating rather than closing inclusion gaps, which contradicts the inclusive FinTech pathways documented elsewhere (Zhu & Guo, 2024; Liu et al., 2024). These contextual factors distinguish Morocco's trajectory from that of the advanced economies, which dominate existing literature.

Managerial implications

From a strategic perspective, it is essential to provide ongoing training for bank employees in order to support the digital transition and foster an innovative internal culture (Tad et al., 2023). Furthermore, strengthening customer confidence requires transparency and communication regarding how algorithms work, as well as data security (Al-Onizat et al., 2024; Badghish et al., 2024). Finally, linguistic adaptation and consideration of cultural specifics, particularly in multilingual environments, can strengthen customer loyalty (Hmoud et al., 2023).

Managers should prioritise AI use cases with demonstrable financial value, such as credit scoring, fraud detection, and automated compliance, while ensuring they are aligned with robust data governance and human-in-the-loop oversight (Sheth et al., 2022). Evidence from transformation roadmaps suggests initiatives should be sequenced according to "readiness \times impact," ensuring that the level of governance, data quality, and investment intensity match the expected returns

(Papathomas & Konteos, 2024; Perals et al., 2025). Specifically in Morocco, our findings highlight the importance of developing foresight and analytics capabilities to translate AI adoption into measurable performance gains.

Limitations of the review

Our study is based on a corpus of around 30 articles selected from a small number of databases (Scopus, Web of Science, and IEEE Xplore). While we have adhered to PRISMA standards, it is possible that some grey literature or studies in other languages may have been omitted due to the limited scope of the databases. Furthermore, the methodological heterogeneity (quantitative, qualitative, and bibliometric) of the studies makes direct comparison of the results complex. Finally, the Moroccan case remains significantly underrepresented (Battanta et al., 2025; Sadok et El Hadi El Maknouzi, 2025), which limits the generalisation of findings.

These constraints justify interpreting the findings as directional rather than absolute. Future PRISMA updates should incorporate Moroccan bank-level datasets and longitudinal designs in order to quantify the contribution of AI to profitability and risk mitigation. Additionally, the heterogeneity of indicators across efficiency, profitability, and risk measures, as documented in the literature, complicates aggregation and necessitates the use of harmonised metrics (Bueno et al., 2024; Heß & Damásio, 2025).

Our empirical validation also has significant limitations. The institutional analysis relies heavily on data from Attijariwafa Bank, which is Morocco's largest private bank and a leader in digital banking. While AWB provides valuable insights, its experience may not be applicable to smaller institutions with different resources and capabilities. The heterogeneity previously documented across Moroccan banks reinforces this concern. Ideally, validation would include panel data covering multiple banks over several years, but such data remains unavailable to the public. Furthermore, we cannot definitively establish causality — while the temporal alignment between AI adoption and performance improvements is suggestive, other factors such as macroeconomic conditions or competitive dynamics may also explain the observed trends.

CONCLUSIONS

Summary of findings

This research examined whether the link between AI and banking performance observed in international studies also applies to emerging markets. Through a PRISMA analysis of 30 studies and empirical validation using Moroccan institutional data, we found that although AI adoption is associated with improved banking outcomes, success is neither automatic nor uniform across institutions.

The Moroccan banking sector showed measurable improvements during the digital transformation period from 2022 to 2024. While deposit growth accelerated, credit expansion was more cautious, suggesting enhanced customer confidence and prudent risk management. Despite lending growth, asset quality remained stable, indicating improved risk assessment rather than merely tighter credit standards. Leading institutions achieved substantial profitability gains, exceeding international benchmarks, while maintaining strong capital buffers to support continued investment in technology.

However, performance varied considerably between banks. Those with prior investments in data governance, strategic foresight, and management commitment achieved exceptional results. Others saw more modest improvements. This heterogeneity shows that it is organisational readiness, rather than technology alone, that determines whether AI investments translate into financial gains.

Contribution to Knowledge

This study contributes to the existing literature in three ways. Firstly, it provides empirical validation of international AI banking findings in an under-researched African market. Despite active digital transformation, Morocco has been notably absent from academic literature, a gap that our institutional data analysis directly addresses.

Secondly, it provides a methodological framework for empirically testing the findings of systematic reviews. The two-stage design — PRISMA documentation followed by institutional validation — demonstrates how global evidence can be grounded in local contexts. This is particularly valuable for emerging markets where there is sparse academic literature, but where administrative data is available.

Thirdly, it identifies organisational readiness as the critical factor in determining the financial impact of AI. Simply adopting technology explains little; what matters is whether banks have built the necessary capabilities in terms of data quality,

governance, analytics, and culture. This shifts the focus from 'Does AI work?' to 'Under what conditions does AI work?', providing a more practical framework for research and practice.

Directions for Future Research

Our findings reveal several research priorities. First and foremost, Moroccan banking requires large-scale empirical studies that go beyond single-institution analysis. Panel data covering multiple banks over several years would enable rigorous testing while controlling for confounding factors. Such studies could employ difference-in-differences designs to compare early versus late adopters, or exploit variation in access to technology as an instrumental variable.

Additionally, comparative research across African and Middle Eastern markets would clarify which findings can be generalised to other emerging economies and which reflect conditions specific to Morocco. Countries such as Kenya, Nigeria, South Africa, Egypt, and the UAE have pursued different digital banking trajectories, providing valuable insights into the impact of regulatory frameworks, infrastructure, and culture on outcomes.

Longitudinal studies tracking banks' progress through AI implementation would reveal how performance effects evolve over time. Our data covers the period from 2022 to 2024. A longer timeframe would show whether early gains persist, whether returns diminish as AI becomes more widely adopted, and how learning curves influence success.

Beyond descriptive evidence, research should investigate the mechanisms linking AI to performance more rigorously. Although we have identified efficiency gains, risk improvements, and enhancements to the customer experience as likely pathways, we cannot quantify the relative contribution of each mechanism. Mediation analyses using detailed process data could help to clarify how AI creates value.

Another priority is to conduct a more in-depth investigation into organisational contingencies: data governance maturity, strategic foresight capabilities, management commitment, and workforce literacy. Studies could develop measurement instruments for these constructs and then test their moderating effects using interaction models or configurational approaches.

Ultimately, research should address the societal implications of AI beyond firm performance. For example, how does AI affect financial inclusion for rural and underserved populations? Does algorithmic decision-making introduce or perpetuate biases? How can explainable AI improve transparency? Which governance ensures ESG alignment? These questions extend to fundamental issues regarding the societal role of technology.

In conclusion, artificial intelligence is measurably reshaping the banking sector, with the extent of this change depending critically on organisational context. Our evidence shows that clear performance benefits can materialise in emerging markets, sometimes exceeding those in advanced economies. However, success is not guaranteed. It hinges on banks developing capabilities, policymakers establishing conducive conditions, and researchers documenting effective strategies and their application. This study contributes to that body of evidence.

ADDITIONAL INFORMATION

AUTHOR CONTRIBUTIONS

All authors have contributed equally.

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CONFLICT OF INTEREST

The Authors declare that there is no conflict of interest.

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ПЕРЕОСМИСЛЕННЯ БАНКІВСЬКОЇ СПРАВИ В ЕПОХУ ШТУЧНОГО ІНТЕЛЕКТУ: СИСТЕМНИЙ АНАЛІЗ ГЛОБАЛЬНИХ ІННОВАЦІЙ І СТРАТЕГІЧНИХ ВИКЛИКІВ У МАРОККАНСЬКОМУ КОНТЕКСТІ (2020–2025 РР.)

Інтеграція штучного інтелекту (ШІ) в банківський сектор привертає все більше уваги в усьому світі завдяки своїй здатності сприяти оптимізації ефективності, зниженню ризиків і підвищенню прибутковості. Великі ринки, такі як Китай та Індія, уже продемонстрували позитивний вплив штучного інтелекту, зокрема за допомогою інтелектуального кредитного скорингу та розмовних чат-ботів, тим самим підвищуючи задоволеність клієнтів. Однак марокканський контекст залишається недостатньо вивченим, незважаючи на те, що банківський ландшафт поступово стає все більш диджиталізованим і існує нагальна потреба в інноваціях, спрямованих на поліпшення клієнтського досвіду з погляду персоналізації, довіри та зручності для користувача.

Щоб розв'язати це питання, ми проведемо систематичний огляд академічної літератури, опублікованої протягом 2020-2025 років, із використанням протоколу PRISMA. Зосередження наших досліджень на Scopus, Web of Science та IEEE Xplore дозволило нам виявити та відібрати близько 30 досліджень, які відповідали нашим суворим критеріям (застосування штучного інтелекту в банківській галузі, фінансові показники, показники задоволеності клієнтів тощо). Вибрані статті були закодовані та проаналізовані на основі їхнього емпіричного й методологічного внеску.

Результати підкреслюють сприятливий загальний вплив штучного інтелекту на банківські показники, включаючи прибутковість, управління ризиками та операційну ефективність, водночас наголошуючи на важливості довіри та персоналізації для покращення клієнтського досвіду. У Марокко дефіцит емпіричних даних робить необхідними цілеспрямовані дослідження для оцінки конкретного впливу штучного інтелекту на місцеві банки та підтримки їхньої цифрової трансформації. Підсумовуючи, цей огляд пропонує кілька напрямів для майбутніх досліджень і пропонує основу для інформування стратегій впровадження штучного інтелекту в банківських установах, що розвиваються.

Ключові слова: штучний інтелект, банківська справа, продуктивність, клієнтський досвід, кредитний скоринг, чат-боти, диджиталізація, цифрова трансформація, марокканський контекст

JEL Класифікація: G21, O33, M15

Appendix A. Summary table of the 30 articles: country, type of AI, performance indicators, customer experience, methodology, and DOI.

N	Authors (Year)	Country / Area	Type of AI	Performance indicators	Customer experience	Methodology	Reference / DOI
1	Nguyen & Le (2025)	Vietnam	Chatbots	Not specified sustainable development)	Satisfaction, intention to use	Quantitative (SEM)	https://doi.org/10.1080/23311975.2024.2443570
2	Liu et al. (2024)	China	AI (unspecified)	B2B relationship performance	Guanxi relationship, trust	Quantitative (SEM, dyadic data)	https://doi.org/10.1016/j.indmarman.2023.11.007
3	Zhu et al. (2024)	Global	Roboadvisors, AI finance	Productivity, efficiency (conceptual)	Trust, adoption, ethics	Systematic review	https://doi.org/10.1016/j.busrres.2023.114494
4	Heß & Damásio (2025)	Global	Machine learning (risk management)	Risk-based (credit, market)	Indirect	Systematic review	https://doi.org/10.1016/j.jime.2025.100324
5	Manta et al. (2024)	Global	AI (Industry 4.0)	Digital transformation by sector	Customisation, UX (indirect)	Bibliometrics	https://doi.org/10.3390/electronics13091693
6	Königstorfer & Thalmann (2020)	Global	Varied AI (Reg-Tech, ML)	Behavioural finance, back office	Acceptance psychological	Structured review + agenda	https://doi.org/10.1016/j.jbef.2020.100352
7	Al-Onizat et al. (2024)	Jordan	AI-driven KMS	Organisational performance	Service improvement	Quantitative (questionnaire, 250)	https://doi.org/10.22059/jitm.2024.96671
8	Goyal et al. (2025)	India	AI credit risk, fraud (ML, ANN)	Technology adoption (fraud detection)	Indirect (trust, adoption)	Quantitative (SEM + ANN)	https://doi.org/10.1186/s43093-025-00464-3
9	Manser Payne et al. (2021)	USA	Chatbots, mobile banking (AI)	Value co-creation relationship	Comfort, satisfaction	Quantitative (SEM AMOS, 218 students)	https://doi.org/10.1108/JRIM-10-2020-0214
10	Singh et al. (2024)	Data Kaggle	ML (churn, classification)	Churn prediction (performance marketing)	Improved customer Follow up	Quantitative (Logistic, XGBoost)	https://doi.org/10.1016/j.dsm.2023.09.002
11	Liu, Li, & Li (2024)	China	FinTech & open banking	ROA, NIM, global performance	Indirect	Quantitative (panel)	https://doi.org/10.1186/s40854-024-00679-3
12	Fares et al. (2023)	Global	Banking AI	(scoring, chatbots, etc.)	General (satisfaction)	Systematic review (PRISMA)	https://doi.org/10.1057/s41264-022-00176-7
13	Perals et al. (2025)	Country panel (OECD)	AI private investment	Institutional efficiency (overhead)	Indirect (macroeconomic Impact)	Quantitative (GMM panel)	https://doi.org/10.1016/j.fir.2025.100009
14	Bueno et al. (2024)	Global	Digitisation & AI	Operational efficiency	Indirect	Thematic review	https://doi.org/10.1016/j.jime.2024.100230
15	Abu-Taieh et al. (2022)	Jordan	M-banking	Adoption, continuing intention	Satisfaction, trust	Quantitative (SEM, mod. ML)	https://doi.org/10.3390/joitmc8030120
16	Tad et al. (2023)	India (Tamil Nadu)	AI & robotics	HR performance (productivity)	Indirect (reduction of errors)	Quantitative (questionnaire, regression)	https://doi.org/10.24857/rgsa.v17n6-012
17	Zhu & Guo (2024)	China	FinTech (AI)	Banking performance (inclusion)	Indirect (trust, adoption)	Quantitative (panel)	https://doi.org/10.1016/j.frl.2023.104872
18	Eustaquio- Jiménez et al. (2024)	Global	Chatbots (financial system)	Costs, service time	Customer satisfaction (availability)	Systematic review	https://doi.org/10.54216/j.IPD.10122
19	Badghish et al. (2024)	India	Voice assistants	Adoption of AI (social learning)	Satisfaction, trust	Quantitative (SEM)	https://doi.org/10.1016/j.techfore.2023.122087
20	Sheth et al. (2022)	Emerging markets	AI banking services	Personalisation, profitability (indirect)	Customer experience (personalised)	Exploratory qualitative (36 interviews)	https://doi.org/10.1108/IJBM-09-2021-0449
21	Li et al. (2025)	China (listed banks)	Digital finance (AI)	ROA, ROE, NPL risk	Indirect	Quantitative (panel, OLS, GMM)	https://doi.org/10.1016/j.irfa.2024.104209
22	Hu et al. (2025)	China	Digital transformation (AI)	Banking soundness (Z-score, CAMEL)	Indirect	Quantitative (Panel, IV-2SLS)	https://doi.org/10.1016/j.jfs.2025.101374
23	Papathomas & Konteos (2024)	Greece (case) / Global	Digital transformation	Marketing/financial KPIs	Customer experience potential	Conceptuel + qualitative study	https://doi.org/10.1057/s41264-023-00223-x
24	Mancuso et al. (2025)	Global (multi-case)	Digital tech. (IA, big data)	Innovation business model	Indirect	Qualitative (23 initiatives)	https://doi.org/10.1016/j.jietm.2024.101299
25	Baffour Gyau et al. (2024)	20 countries (panel)	AI technology innovation	ROA, ROE, profitability, moderators	Indirect	Quantitative (FGLS, GMM)	https://doi.org/10.1016/j.irfa.2024.103700
26	Ho & Chow (2024)	Hong Kong	IA marketing banking	Brand preference (indirect performance)	Customer experience	Quantitative (PLS-SEM, 300 Respondents)	https://doi.org/10.1057/s41264-022-00207-3
27	Hakmaoui et al. (2022)	Morocco	CF + CI	Strategy, knowledge creation Knowledge creation	Indirect	Qualitative (longitudinal case study)	https://doi.org/10.1016/j.techfore.2021.121139
28	Hmoud et al. (2023)	Jordan	Chatbots	Adoption, attitude	Satisfaction/adoption	Quantitative (PLS-SEM, 429 respondents)	https://doi.org/10.1016/j.heliyon.2023.e20686
29	Sadok & El Hadi El Maknoui (2025)	Morocco	FinTech (NPL impact)	NPL, banking performance	Indirect (not customer-focused)	Quantitative (panel, correlations)	https://doi.org/10.12688/f.1000research.158024.2
30	Battanta et al. (2025)	Morocco (Islamic banks)	FinTech, RegTech	Miscellaneous (state of the literature)	Indirect (customer rarely measured)	Review (literature review)	https://doi.org/10.13135/2421-2172/10550