

AI as a Managerial Transformation Lever in Banking Risk Management: An Exploratory analysis of the Moroccan context

L'IA comme levier de transformation managériale dans la gestion des risques bancaires : Une analyse exploratoire du contexte marocain

Sara HALOUI, (Associate Professor)

*Panqfrican Laboratory for Research in Economics, Management and Innovation
National School of Commerce and Management
Moulay Ismail University – Meknès, Morocco*

Nawal EL HAOUARI, (Associate Professor)

*Panqfrican Laboratory for Research in Economics, Management and Innovation
National School of Commerce and Management
Moulay Ismail University – Meknès, Morocco*

Correspondence address :	National School of Commerce and Management Moulay Ismail University, Meknes, Morocco.
Disclosure Statement :	The authors declare that they have not received any financial support that could have influenced the objectivity of this study. They take full responsibility for any potential plagiarism, the use of artificial intelligence in the writing process, as well as for the results presented in this article.
Conflict of Interest :	The authors report no conflicts of interest.
Cite this article :	HALOUI, S., & EL HAOUARI, N. (2025). AI as a Managerial Transformation Lever in Banking Risk Management: An Exploratory analysis of the Moroccan context. <i>International Journal of Accounting, Finance, Auditing, Management and Economics</i> , 6(12), 156–173. https://doi.org/zenodo.17507678
License	This is an open access article under the CC BY-NC-ND license

AI as a Managerial Transformation Lever in Banking Risk Management: An Exploratory analysis of the Moroccan context

Abstract:

Artificial Intelligence (AI) stands today at the heart of global economic and financial transformations. It represents a major innovation that is reshaping traditional management models and redefining the strategies of economic actors. Its impact is particularly significant in the banking sector, where integration of AI technologies has become essential to enhance performance, competitiveness, and institutional resilience. In a context of accelerated digitalization, Moroccan banks are increasingly required to adopt advanced technological tools to anticipate and manage the growing complexity of financial risks.

The purpose of this research is to analyze the various applications of AI, considered as a complex digital technology, in banking risk management within Morocco. Through a qualitative exploratory approach—based on interviews conducted with managers from three major Moroccan banks and an in-depth literature review—this study examines the contribution of AI to credit scoring, fraud detection, regulatory compliance, and overall risk assessment.

The findings reveal that AI is gaining a central role in banking decision-making processes. The substantial investments made in this field reflect a strong commitment to sustainable integration. AI enables banks to achieve significant savings in time and cost, mitigate losses, better anticipate emerging risks, and maintain financial stability. This study thus highlights the strategic importance of AI as a key driver of innovation and transformation within the Moroccan banking system, while also opening new perspectives for research on digital risk management and financial technology adoption in emerging economies.

Keywords : Artificial Intelligence; Banking Risk Management; Credit Risk; Economic impact; Fraud Detection; Compliance.

Classification JEL: G32, M15

Paper type: Empirical Research

Résumé :

L'intelligence artificielle (IA) est aujourd'hui au cœur des transformations économiques et financières mondiales. Elle constitue une innovation majeure qui révolutionne les modèles traditionnels de gestion et redéfinit les stratégies des acteurs économiques. Son impact est particulièrement perceptible dans le secteur bancaire, où son intégration devient essentielle pour renforcer la performance, la compétitivité et la résilience des institutions financières. Dans un contexte de digitalisation accélérée, les banques marocaines sont désormais contraintes d'adopter des outils technologiques avancés pour anticiper et maîtriser les risques de plus en plus complexes auxquels elles sont exposées.

L'objectif de ce travail scientifique est d'analyser les différentes utilisations de l'IA, considérée comme une technologie numérique complexe, dans la gestion des risques bancaires au Maroc. À travers une approche exploratoire qualitative, fondée sur des entretiens menés auprès de responsables de trois grandes banques marocaines et une revue approfondie de la littérature, cette recherche examine l'apport de l'IA dans les domaines du scoring de crédit, de la détection des fraudes, de la conformité réglementaire et de l'évaluation du risque global. Les résultats obtenus montrent que l'IA occupe une place de plus en plus centrale dans les processus décisionnels bancaires. Les investissements réalisés dans ce domaine témoignent d'une volonté d'intégration durable de l'IA, permettant non seulement de générer des gains considérables en temps et en coûts, mais aussi de réduire les pertes, de mieux anticiper les risques émergents et de préserver la stabilité financière. Ce travail met ainsi en évidence le rôle stratégique de l'IA dans l'innovation et la transformation du système bancaire marocain.

Mots-clés : Intelligence Artificielle, Gestion des Risques bancaires, Risque de Crédit, Impact économique, Détection des fraudes, Conformité.

JEL Classification : G32, M15

Type du papier : Recherche empirique

1. Introduction

In an increasingly digitalized world marked by recurrent disruptions, persistent international turbulences—such as armed conflicts, pandemics, and financial crises—generate geopolitical, economic, and strategic risks that inevitably translate into major financial risks on a global scale. In the face of this chronic instability, organizations must reinforce their protective mechanisms and fully leverage technological advances, among which artificial intelligence (AI) stands out as one of the most significant technological revolutions of the past decade. As a key instrument in financial operations, particularly in compliance-driven environments, AI offers pronounced operational benefits while raising crucial concerns regarding transparency, fairness, and institutional trust in AI-driven decisions (McNally & Bastos, 2025).

The rapid rise of digital technologies has progressively permeated all sectors of human activity (Doua, 2022). Within this global momentum, Morocco aspires to position itself as a regional leader in AI adoption on the African continent. Yet, assessing the economic impact of such technologies remains complex, both globally and in the Moroccan context, due to sector-specific particularities. The banking industry, in particular, is characterized by operational complexity and continuous exposure to diverse risks, underscoring the need to deploy advanced technological tools to address these challenges. In this sector, the adoption of AI is not confined to technological optimization; rather, it extends to a profound managerial transformation involving organizational structures, responsibilities, and employee engagement.

AI also acts as a transformative force by reshaping managerial practices and redefining the nature of work. Benhamou, Janin, Bocognano, Charrié, and Thibault (2018) emphasize that AI alters task distribution, enhances decision-making processes, and requires new skill sets, thereby redefining managerial roles. While Bhattacharya and Sinha (2022) highlight AI's contribution to improving customer experience through personalization and automation, this study extends the analysis to another managerial dimension—risk management—by exploring how AI can act as a strategic lever for anticipating vulnerabilities and strengthening decision-making in Moroccan banks.

Financial risk management is a critical issue for banks, requiring rigorous and responsive approaches based on reliable data. The integration of AI technologies directly aligns with this logic: it enables the anticipation of losses, identification of new opportunities, optimization of accounting processes, consolidation of data utilization, improvement of customer experience, and ultimately, the enhancement of financial performance. Among AI-driven technologies, several tools distinguish themselves by their robustness, precision, and efficiency, offering tailored solutions to the multiple challenges of banking risk management. Facing growing threats that could affect their stability and sustainability in financial markets, banks can now select, for each type of risk, the technologies best suited to their specific needs.

Technological innovations—particularly AI—thus emerge as a driving force for transformation. They profoundly reshape the operational models of financial institutions and compel them to reinvent both their practices and their governance frameworks. Castanet and Planes (2018) describe AI as a structural revolution in the financial sector, one that reconfigures decision-making processes and organizational models. Building on this perspective, the present study explores how AI can be leveraged as a managerial transformation lever in banking risk management, with a particular focus on the Moroccan context.

Accordingly, this research is guided by the following question:

“How can artificial intelligence, as observed in foreign banks, improve risk management within Moroccan banks?”

To address this question, we adopt a twofold methodology: first, a literature review outlining the theoretical foundations of AI and its applications in risk management; second, a qualitative exploratory study conducted with several Moroccan banks. The first part presents the key

concepts, the evolution of AI since the 1950s, and the main tools used in banking. The second part reports empirical findings from Moroccan banking actors, followed by a discussion of the main insights and future research perspectives.

2. Literature Review

In recent years, financial institutions have been restructuring their traditional business models to address the new challenges of the 21st century. New technologies are an integral part of this transformation. Banks perceive both opportunities and challenges associated with these emerging technologies (Senden & Henrard, 2021).

2.1. Artificial Intelligence: An Overview

Artificial Intelligence (AI) is garnering growing interest in scientific, technological, and economic spheres. Before delving into its implications for banking risk management, it is essential to briefly revisit the origins, definitions, promises, and limitations of the concept.

One of the first to explore the notion of machine intelligence was Alan Turing, in his renowned paper *Computing Machinery and Intelligence* (Turing, 1950). He introduced the “Turing Test,” an experiment designed to assess whether a machine can imitate human behavior to the extent of becoming indistinguishable. If a human is unable to differentiate between the machine and a human interlocutor, the machine is deemed “intelligent.”

The fundamental goal of AI is to replicate—or even surpass—certain human cognitive functions such as reasoning, learning, and decision-making. According to El-Ouidani and Oul-Caid (2023), AI aims to endow machines with the ability to think and act like human beings.

Broadly speaking, AI enables computer systems to process large volumes of data and extract knowledge using sophisticated algorithms. Unlike classical statistical analysis, AI can detect subtle correlations, model complex behaviors, and produce dynamic forecasts. As Portnoff and Soupizet (2018) point out, AI opens up unprecedented opportunities for understanding and anticipating economic and social phenomena.

According to Mateu and Pluchart (2019), the progress of AI raises hopes for increased consumer spending, improved productivity across most professions, and enhanced risk management. However, these advancements also bring fears of mass job displacement in developed countries, forced reskilling, deepening digital divides, and, more broadly, a shift toward the transhumanization of society (Bostrom, 2024).

In the same vein, Mateu and Pluchart (2019) regard AI as a driving force behind the technological, organizational, and societal revolution of the 21st century. Nonetheless, the field is increasingly affected by a crisis of trust, due to the opacity of its models and algorithms (Servan-Schreiber, 2018).

It is also worth emphasizing the potential synergies between AI and other digital technologies such as big data, blockchain, and the Internet of Things (IoT). However, the economic impact of such combinations will vary depending on the complexity and structure of each sector.

2.2. AI Deployment in the Banking Sector: A Revolution in Motion

Artificial Intelligence (AI) has gained unprecedented attention in recent years, driven by four major catalysts: the rapid expansion of global communications enabling instant data transfer; exponential increases in computing power (capable of billions of operations per second); the explosion of data availability (big data); and major advances in self-learning algorithms. Together, these developments have given rise to an entirely new technological ecosystem (Portnoff & Soupizet, 2018).

Among the industries most exposed to complex and multifaceted risks, the banking sector stands out for its continuous need to access advanced tools to anticipate, model, and mitigate both traditional risks (credit, market, liquidity) and emerging risks such as global pandemics

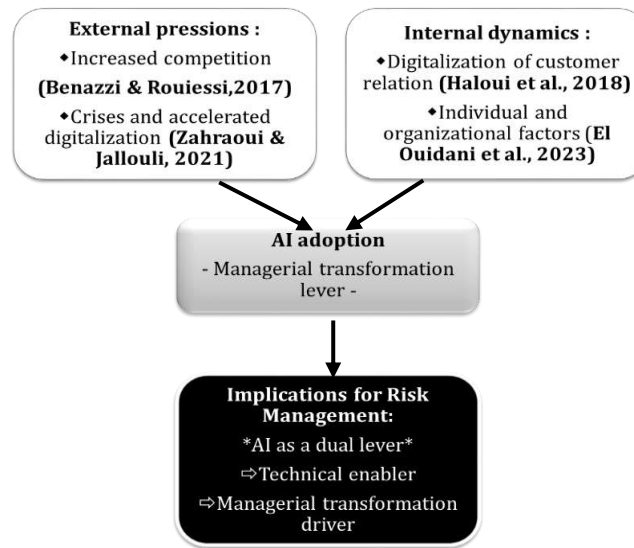
and climate change. In this regard, AI has become a vital tool for enhancing predictive capabilities, identifying patterns in near-real time, and supporting automated decision-making systems.

In the banking sector, the integration of artificial intelligence (AI) has been increasingly recognized as a transformative tool for risk management, particularly in relation to credit and fraud detection. As Guyader (2021) points out, “AI systems provide highly effective solutions for banking risk management. This risk is a major concern for banks, whether it relates to credit or to fraud involving payment methods. ... AI represents a major breakthrough through its ability to leverage this vast data base using relevant, adaptive, and customizable analytical algorithms.” This highlights the growing role of AI in enhancing the accuracy and responsiveness of risk assessment models, while enabling banks to capitalize on large and complex datasets.

In line with this perspective, research in the Moroccan context has emphasized that digitalization is not only a driver of operational efficiency but also a key instrument for improving risk management. The Moroccan banking industry is marked by increasing competitive pressure, as demonstrated by Benazzi and RouieSSI (2017) through the Panzar and Rosse model. This dynamic environment compels banks to constantly seek innovative solutions to strengthen their market position and enhance operational resilience. The Covid-19 crisis has further accelerated this trend by boosting the adoption of digital payments, paving the way for a sustainable transformation of financial services (Zahraoui & Jallouli, 2021). In parallel, the digitalization of customer relations has emerged as a pivotal mechanism for improving decision-making and supporting proactive risk management practices (Haloui, Abourmane, & Taouab, 2018). Yet, the adoption of AI is not merely a technological upgrade but also a managerial and behavioral challenge. El Ouidani, Outouzzalt, and Bengrich (2023) demonstrate that individual factors—such as self-efficacy, openness to innovation, and professional image—significantly shape employees’ willingness to embrace AI. These findings underscore that the effectiveness of AI as a lever for banking risk management depends on both technological capabilities and organizational readiness, thus reinforcing its dual role as a technical enabler and a managerial transformation driver. Taken together, these insights suggest that the convergence of competitive forces, crisis-driven digital acceleration, and organizational change has laid the groundwork for the adoption of artificial intelligence in Moroccan banks. AI enables banks to rapidly analyze vast numbers of data points, extract relevant insights, and build predictive models that outperform traditional statistical tools. These capabilities provide financial institutions with a strategic advantage in terms of resilience and customer performance.

Based on our literature review, Figure 1 presents the conceptual framework we propose. It illustrates how AI functions as a managerial transformation lever in banking risk management in Morocco, through the interplay between external pressures (driving innovation and digitalization) and internal dynamics (enabling organizations and employees to adopt AI).

Figure 1: Conceptual Framework - AI as a transformation lever



Source: Author's elaboration

According to the European Banking Authority (2019, p. 38), AI applications in banking back-office functions are mainly concentrated around four areas, as shown in the Figure 2.

Figure 2: Degree of AI Application in Back-Office Operations



Source: EBA (2019), Risk Assessment Questionnaire – Summary of the Results

a. Fraud Detection:

- Nearly 50% of institutions have not initiated any action.
- Around 20% are already using AI tools, and a similar share is in the planning or development phase.
- A small fraction is conducting pilot tests.

b. Customer On-boarding Processes:

- Approximately 40% are in the discussion phase.
- A limited number have deployed operational solutions or are conducting tests.

c. Other AML/CFT Processes (Anti-Money Laundering / Countering the Financing of Terrorism):

- Over 30% are still being discussed.
- Some are in pilot or development stages.

d. Data Quality Improvement:

- Around 40% have not initiated any projects.
- A moderate number are in discussion or development, with a small share already operational.

Survey synthesis:

- Fraud detection is the most mature area, although adoption is still limited.
- Onboarding, AML/CFT, and data quality initiatives are largely in exploratory or early implementation stages.
- Overall AI transformation remains uneven, but adoption momentum is growing.

In this context, banks are setting new priorities at the heart of the AI-driven transformation. Key focus areas include:

- Counterparty risk mitigation,
- Fraud detection and prevention,
- Advanced risk modeling and evaluation,
- Deep learning for regulatory supervision,
- Automated stress testing,
- Real-time fraud response mechanisms.

Implementing AI to address these challenges requires substantial investment, including specialized platforms, high-performance infrastructure, machine learning libraries, and hardware accelerators optimized for AI workloads. These resources are essential for banks to meet the increasing demands of the digital age. Beyond a purely technological shift, AI therefore represents a strategic and managerial lever to reinforce risk management practices while sustaining competitive advantage.

2.3. AI Applications in Banking Risk Management

In recent years, applications of Artificial Intelligence (AI) have multiplied, impacting nearly every area of banking activity. According to Portnoff and Soupizet (2018), some experts even speculate that AI may one day surpass human intelligence. This prospect compels a fundamental rethinking of the division of roles between humans and machines, as well as the nature of their interaction.

Today, banks harness the power of AI and machine learning (ML) to transform their processes in quality control, data evaluation, regulatory compliance, and fraud detection (Thomas, 2018). The Table 1 is an overview of the most widely used AI technologies in risk management:

Table 1: Summary of AI Technologies and Their Functions

AI Technology	Main Functions in Risk Management
Machine Learning (ML)	Fraud detection, predictive credit risk analysis, cyber threat detection, dynamic client assessment
Deep Learning	Modeling of complex behaviors, banking supervision, image processing, non-linear predictions
Natural Language Processing (NLP)	Customer communication analysis, intent detection, emotion recognition, information extraction from text
Big Data Analytics	Multi-source data aggregation, risk model optimization, weak signal detection, decision support
K-Nearest Neighbors (KNN)	Credit scoring, regression, missing data imputation, classification and prediction from historical data

Source: Author's elaboration

Over the past few decades, a great many classification methods have been developed in real applications [Luo et al. 2016; Zhu et al. 2016; He et al. 2016; Li et al. 2016], among of which k Nearest Neighbors (kNN) classification has been regarded as one of the top 10 data-mining algorithms [Wu et al. 2008], due to its simplicity and efficiency. Thus the kNN method has been successfully developed in data-mining applications, such as classification, regression, and missing value imputation (Zhang et al., 2017).

2.3.1. Detailed Technologies

2.3.1.1. Machine Learning

Machine learning relies on algorithms capable of detecting abnormal behaviors based on historical data. Institutions use it to anticipate fraud, strengthen cybersecurity, and refine credit risk assessments. Rather than relying solely on a client's credit history, banks now integrate market conditions, digital behaviors, and weak signals to make real-time credit decisions (Yska et al., 2023; Milojević & Redzepagić, 2021).

2.3.1.2. Deep Learning

Deep learning uses multilayer neural networks to process unstructured data. Unlike ML, it does not require explicit instructions to identify key features. It is particularly well-suited to banking supervision and the analysis of complex situations, notably in stress testing and automated anomaly detection (Gigante & Zago, 2022).

2.3.1.3. Natural Language Processing (NLP)

An interdisciplinary field combining linguistics, computer science, and AI, NLP enables the processing and interpretation of customers' verbal and written interactions. It supports intent analysis, emotion detection, automated summarization of regulatory documents, and classification of incoming emails.

2.3.1.4. Big Data Analytics

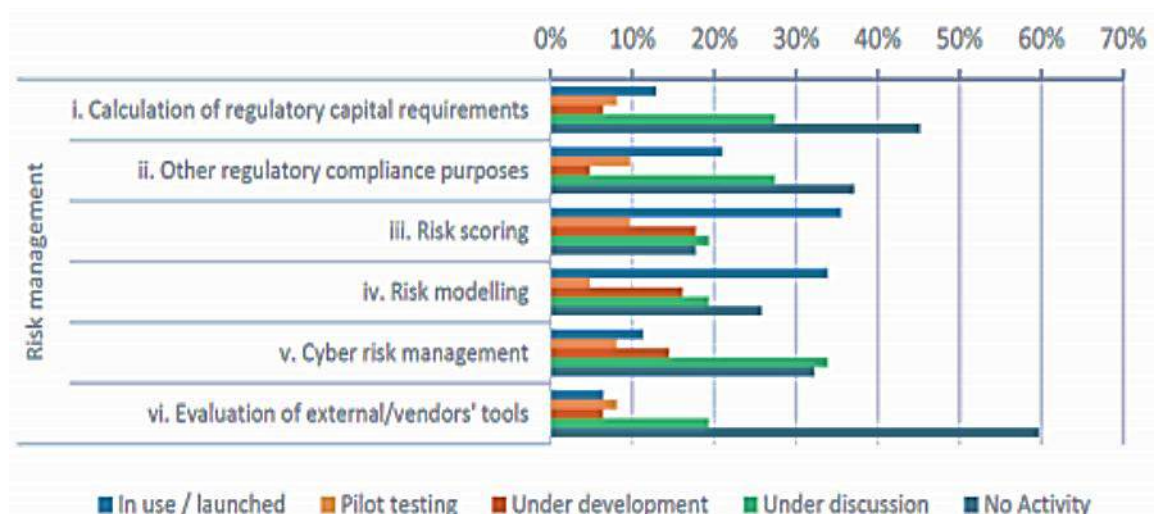
Banks leverage big data to aggregate internal and external sources (transactions, customer behavior, web data, social media). Tools such as Hadoop enable localized data processing, enhancing the speed and relevance of risk analysis.

2.3.1.5. K-Nearest Neighbors (KNN)

Used for classification, regression, and missing data imputation, the KNN method has shown high performance in credit risk evaluation (up to 94% accuracy, according to Amzile & Amzile, 2021). Its effectiveness lies in the semantic proximity between observed cases and historical data.

Figure 3 below illustrates the progress in adopting AI technologies across various domains of banking risk management.

Figure 3: Degree of AI Application Usage in Banking Risk Management



Source: EBA (2019, p. 38), Risk Assessment Questionnaire – Summary of the Results

Analyzed domains:

1. **Regulatory Capital Requirement Calculations:** 50% inactive, few initiatives implemented.
2. **Regulatory Compliance:** Majority already in use or under discussion.
3. **Risk Scoring:** Largely deployed or under development.
4. **Risk Modeling:** In discussion or pilot testing stages.
5. **Cyber Risk Management:** High level of activity, many projects operational.
6. **Evaluation of External Tools/Providers:** Still a largely unexplored area.

The most mature AI applications are found in cyber risk management, risk scoring, and regulatory compliance. In contrast, advanced modeling and the integration of external AI solutions remain areas with significant room for improvement.

Several authors agree on the transformative role of artificial intelligence in finance; however, Bellaaj (2023) emphasizes that the integration of AI into the banking sector is accompanied by significant challenges, particularly in terms of data security, regulatory compliance, and the management of operational risks.

2.4. Typology of Banking Risks Managed by AI

In the banking sector, artificial intelligence (AI) is increasingly used to manage a wide variety of risks. The main areas of application include credit risk, market risk, operational risk, model risk, contagion risk, cybersecurity risk, and compliance risk.

Credit risk, which refers to the potential loss resulting from a borrower's or counterparty's failure to meet financial obligations, is increasingly addressed using machine learning and natural language processing (NLP) techniques. These tools enable more dynamic assessments of default probabilities and enhance the early detection of warning signals, thereby improving credit risk monitoring and decision-making.

In the context of market risk, which arises from the volatility of financial assets, AI is used to process vast amounts of external data, including social media feeds and financial news platforms. By leveraging deep learning and NLP, banks can analyze market sentiment, identify emerging trends, and adjust investment strategies in real time.

Operational risk, defined as the risk of loss due to inadequate or failed internal processes, human errors, or external events, is also subject to AI-driven surveillance. Machine learning algorithms process both structured and unstructured data—such as internal risk reports—to identify systemic weaknesses, automate control processes, and suggest appropriate corrective actions.

Model risk occurs when predictive models used by banks are biased, poorly calibrated, or misapplied. AI is employed not only to build these models but also to monitor and validate them, ensuring accuracy, fairness, and accountability. The use of explainable AI is particularly important in this context to enhance transparency and trust.

Regarding cybersecurity risk, banks are increasingly exposed to sophisticated and diverse cyber threats. Machine learning and deep learning technologies are applied to detect anomalies in network activity, identify malicious behavior, and predict attack patterns, including likely targets and infiltration methods.

Contagion risk refers to the systemic impact of external shocks—such as financial crises, pandemics, or the collapse of major counterparties—on a bank's risk exposure. AI is used to simulate inter-institutional linkages, monitor systemic indicators, and support adaptive mitigation strategies based on early warning signals.

Finally, compliance risk—the risk of legal sanctions, financial losses, or reputational damage due to non-compliance with regulatory requirements—is a major concern for banks. AI contributes to automating regulatory monitoring, identifying compliance gaps, and strengthening internal control mechanisms.

Digital transformation is accelerating the development of artificial intelligence, which in turn is accelerating digital transformation, thus irreversibly permeating society. The integration of artificial intelligence in the functioning of companies and its use throughout all societal life raises the question of the probable associated risks.

The exploratory analysis revealed that Moroccan banks are deploying artificial intelligence tools across a broad spectrum of risk management domains. Table 2 provides a synthesis of the main types of risks addressed and the corresponding AI technologies adopted. These insights highlight not only the diversity of risk profiles but also the strategic alignment of AI implementation with banks' risk governance structures.

Table 2: Typology of Banking Risks and AI Applications

Type of Risk	Definition	AI Technologies Used	Key Applications
Credit Risk	Risk of borrower or counterparty default	Machine Learning, Natural Language Processing (NLP)	Default probability estimation, early warning signal detection
Market Risk	Risk of financial loss due to market fluctuations	Machine Learning, Deep Learning, NLP	Market trend forecasting, sentiment analysis from social media and news feeds
Operational Risk	Risk from inadequate processes, human errors, or system failures	Machine Learning	Detection of internal weaknesses, risk reporting analysis, control process automation
Model Risk	Risk of errors or misuse in predictive models	Machine Learning, Explainable AI	Model validation, bias and inaccuracy detection, algorithmic auditability
Cybersecurity Risk	Risk of attacks on IT systems	Machine Learning, Deep Learning	Anomaly detection, attack prediction, network behavior analysis
Contagion Risk	Risk of systemic impact from external shocks	Deep Learning, Machine Learning	Simulation of interbank linkages, systemic risk monitoring, early warning system for financial crises
Compliance Risk	Risk of legal or regulatory sanctions for non-compliance	Machine Learning, NLP	Regulatory monitoring, gap detection, automation of compliance processes

Source: Author's elaboration

Among all risk categories, credit and market risks appear to be the most advanced in terms of AI integration, particularly through machine learning models and natural language processing. In contrast, areas such as model risk and contagion risk are still in a nascent phase but show promising potential for more robust risk anticipation and resilience planning.

Addressing these risks requires a combination of technological solutions, ethical considerations, and policy interventions (Ashta & Mogha, 2023).

As highlighted by Espinoza and Ygnacio (2023), "Some of the most widely used models are based on Artificial Intelligence (AI) techniques, especially Neural Networks and Random Forest." This underscores the pivotal role of AI in transforming credit risk assessment models, a transformation that is increasingly pertinent in the context of Moroccan banking institutions.

3. Research Methodology

This study adopts a qualitative exploratory research design, aimed at identifying and categorizing the different types of banking risks addressed by artificial intelligence (AI) in the Moroccan context. Given the nascent stage of AI integration in Moroccan financial institutions, an inductive approach was deemed appropriate to explore managerial perceptions, strategic orientations, and operational implementations.

The empirical phase was based on semi-structured interviews conducted with senior risk managers, IT officers, and innovation directors in three major Moroccan banks. The interviews

were carried out between March and May 2025, with a total of nine respondents. An interview guide was developed around three main themes: types of risks managed by AI; AI technologies used; and perceived challenges and managerial implications.

The data collected were analyzed using thematic content analysis, following Braun and Clarke's (2006) method. Coding was performed manually and cross-validated to ensure the reliability of the categories. The analysis led to the construction of a typology of risks managed by AI, supported by practical examples and managerial insights.

Among the main motivations for this research is the statement by Dr. Amal El Fallah Seghrouchni, Minister Delegate to the Head of Government in charge of Digital Transition and Administrative Reform, former Executive President and current Honorary President of the International Center for Artificial Intelligence of Morocco (AI Movement), established in March 2021 as part of a strategic initiative led by Mohammed VI Polytechnic University (UM6P). According to her: "Morocco aims to become a true hub through this center to develop artificial intelligence across the African continent," she explains.

To address this study, we proposed the following questions to the interviewees:

- Approximately, how many years ago did your bank begin adopting AI tools?
- Over the past few years, which digital transformation initiatives has your bank undertaken?
- In what ways is your bank currently using AI to support credit risk management, fraud prevention and compliance?
- What are the main challenges or barriers your bank has faced in implementing AI for risk management, and how have employees and management adapted to these changes?
- How do you envision AI shaping your bank's risk management strategies over the next 3–5 years, both technologically and managerially?

4. Exploratory study results

We began this exploratory study with the AI adoption timeline in Moroccan banks, as followed:

4.1. AI adoption timeline in Moroccan banks

4.1.1. AWB (Attijariwafa bank)

While no official launch date is publicly confirmed, Attijariwafa bank has been actively involved in AI-related open innovation initiatives for several years. Its "Smart Up" program, oriented toward fintech and AI-enabled innovation solutions – dates back to 2017. More recently (2025), the bank launched "Open Start by Wenov", a program explicitly targeting AI innovation by collaborating with startups and ecosystem partners. ⇒ Taking these milestones into account, we can infer that Attijariwafa bank has been embedding AI systematically since at least 2017, with stronger AI-specific efforts emerging around 2024–2025.

4.1.2. Central Popular Bank (BCP)

There is no precise public date for the first AI initiatives at BCP. However, AI-enhanced fraud detection and credit analysis projects within Moroccan banks—including BCP—are mentioned in broader sector-wide programmes such as BankTech AI, initiated in partnership with Bank Al-Maghrib and fintechs; this project likely began around 2022.

Furthermore, a sector-wide performance study published January 2025 shows that all three major banks (including BCP) had already implemented intelligent chatbots and fraud detection systems by 2023.

⇒ That suggests BCP began adopting AI in earnest around 2022–2023.

4.1.3. Bank Of Africa (BOF)

Bank of Africa had already launched major AI initiatives—such as intelligent chatbots and advanced fraud detection—by 2023.

Additionally, BMCE Capital (investment banking arm) launched “Cap’AI by BK” in April 2025, a dedicated open innovation program focused on AI, hyper-personalization, automation and decision-support systems.

⇒ This indicates that initial AI deployment began in 2023, with formal programs accelerating in 2025.

Table 3 provides a summary of the approximate starting dates of AI in Moroccan banks and their major milestones.

Table 3: Summary table of AI adoption in Moroccan banks

Bank	Approximate Start of AI Adoption	Milestones
AWB	~2017 (innovation) / 2024–25 (AI projects)	Smart Up (2017); Open Start by Wenov (2025)
BCP	~2022–2023	Participation in BankTech AI; chatbots and fraud systems rollout
BOF	~2023 / formal boost in 2025	AI systems in 2023; Cap’AI program launched April 2025

Source: Author’s elaboration

4.2.Digital transformation initiatives

In Table 4 below, we compare the main digital transformations implemented by Moroccan banks in recent years.

Table 4. Comparative table – Digital transformations in Moroccan banks

Area / Bank	AWB	BCP	BOA
Mobile banking & digital onboarding	L’bankalik: account opening via selfie, fully mobile journey	Chaabi Mobile / Chaabi Net: 24/7 remote banking services	BMCE Direct: enhanced customer experience and fully digital customer acquisition journey
Advanced applications	Attijari Mobile: multi-account management, secure messaging, digital statements	Pocket Bank (360° view, bill/tax payments, mobile top-ups) + New Banque Populaire app with multi-bank aggregation and spending categorization	App features strengthened with Mastercard technology (tokenization, e-commerce, digital payments)
Payments & wallets	Attijari Payment Processing awarded by Visa for digital innovation ; partnership with MadfoatCom to modernize bill payment platforms in Morocco	BPay: mobile wallet enabling peer-to-peer transfers, merchant payments, and bill settlement	Mastercard partnership (2024): roadmap for digital payments, financial inclusion, tokenization, and e-commerce
Trade finance & corporate solutions	Not specifically highlighted	Participation in Komgo: digitalization of letters of credit and guarantees	SCF by BOA: Morocco’s first fully digital supply chain finance platform
Innovation & partnerships	Strong collaborations with fintechs and global payment providers (e.g., Visa, MadfoatCom)		

Source: Author’s elaboration

Critical Analysis:

- Common trends: All three banks are prioritizing mobile banking, digital payments, and fintech partnerships. This shows a systemic alignment with Morocco’s financial inclusion and digital economy and fintech partnerships. This shows a systemic alignment with Morocco’s financial inclusion and digital economy strategies.

- **Differentiation:**
 - Attijariwafa bank stands out with its end-to-end digital onboarding (L'bankalik) and strong youth-oriented positioning.
 - BCP emphasizes a diversified ecosystem of apps and wallets, and is the most active in trade finance digitalization (through Komgo).
 - BOA is pioneering in supply chain finance digitalization with SCF by BOA and leveraging global partnerships with Mastercard for cutting-edge payment solutions.
- **Challenges:**
 - Banks still face issues of digital literacy among customers, cybersecurity risks, and the need to scale up open banking initiatives.
 - The competitive edge will increasingly depend on how these institutions integrate AI, big data analytics, and blockchain into their digital ecosystems.
- **Future outlook:**
 - The Moroccan banking sector is moving towards a hybrid model, blending traditional banking with platform-based financial services.
 - We may expect more regional fintech partnerships, cross-border payment innovations, and wider adoption of digital KYC and e-signature processes.

4.3.Current applications of AI : Credit risk, Fraud and Compliance

Table 5 below presents the AI use cases in Moroccan banking in three areas:

Table 5: Comparative table - AI on credit risk, fraud and compliance

Bank	Credit Risk (AI)	Fraud Detection (AI)	Compliance / AML-FT (AI)
AWB	ML-driven credit scoring; agent-based modeling (2019)	Real-time anomaly detection; AI chatbots for alerts	KYC, transaction monitoring, blockchain-aided traceability
BCP	AI-enhanced credit decisioning and stress testing	AI-powered cybersecurity and fraud analytics since 2023	Automated screening: sanctions, AML, KYC tools
BOA	AI support for underwriting and SME/trade credit risk	Real-time ML alerts across channels; behavioral analytics	Group-wide AI compliance system; real-time list filtering & transaction monitoring

Source: Author's elaboration

Key Observations & Insights:

- **Shared capabilities:** All three banks deploy ML/AI for fraud detection, transaction anomaly monitoring, and automated compliance processes (KYC, AML, sanctions).
- **Differentiation points:**
 - ✓ Attijariwafa bank shows early experimentation via agent-based credit risk models at least since 2019.
 - ✓ BCP emphasizes resilient AI fraud detection and credit portfolio management, scaling post-cyber incident.
 - ✓ BOA integrates AI into its governance structure across multiple African markets via group-wide compliance infrastructure.

Sector trends: Regional studies affirm that AI-driven fraud detection significantly improves anomaly detection accuracy and operational efficiency, but raise challenges around transparency, bias, and explainability—vital for audit and compliance acceptance (Yaseen & Al-Amarneh, 2025).

4.4.Challenges and organizational readiness

The insights from the three Moroccan banks—Attijariwafa Bank (AWB), Central Popular Bank (BCP), and Bank of Africa (BOA)—reveal both commonalities and specific differences in the challenges encountered when adopting AI for risk management.

Common challenges across the three institutions include:

1. Data-related constraints (fragmentation, quality, integration with legacy systems), which appear as a structural barrier to fully exploiting AI potential.
2. Human and cultural resistance, with employees initially perceiving AI as a threat to job security or as a "black box" lacking transparency.
3. Regulatory and ethical concerns, particularly regarding the fairness of algorithms and the protection of customer data.

At the same time, each bank faces context-specific challenges:

- **AWB** highlights the regulatory uncertainty and data governance issue, reflecting its position as a leading player with complex cross-subsidiary operations.
- **BCP** emphasizes employee resistance and system integration difficulties, aligned with its large and historically traditional workforce.
- **BOA** underlines the cost and complexity of deployment across multiple African markets, pointing to the additional challenge of international expansion and heterogeneous regulatory environments.

From a managerial perspective, all three banks have responded by deploying change management strategies:

- Training and upskilling initiatives to build employees' confidence in AI (AWB).
- Awareness campaigns and workshops to foster acceptance and trust (BCP).
- Cross-functional teams and collaborative governance to accelerate adoption and mitigate fears (BOA).

Taken together, these findings confirm that the adoption of AI in Moroccan banking is not only a technological challenge but also a profound managerial transformation. Successful integration depends on a dual capability: technical capacity (data infrastructure, system interoperability) and organizational readiness (cultural adaptation, employee engagement, regulatory alignment).

4.5.Future perspectives

The perspectives of Attijariwafa Bank (AWB), Central Popular Bank (BCP), and Bank of Africa (BOA) suggest a converging vision of artificial intelligence as a transformative force in banking risk management over the next three to five years.

From a technological standpoint, all three banks anticipate a growing reliance on predictive analytics, real-time monitoring, and automation. AWB underscores the use of AI to strengthen credit scoring and fraud detection, BCP highlights its role in compliance and anti-money laundering systems, while BOA emphasizes cross-border risk assessment and systemic risk anticipation across multiple African markets. Despite differences in focus, the common denominator is the deployment of AI as a proactive tool to identify, mitigate, and even prevent risks before they materialize.

From a managerial perspective, the three institutions equally recognize that AI adoption requires profound organizational adjustments. AWB emphasizes transparency, algorithmic governance, and reskilling; BCP underscores the importance of cultural change and employee acceptance; and BOA envisions more agile and collaborative structures linking risk officers, data scientists, and business units. Collectively, these insights reinforce the notion that AI integration is not solely a technological upgrade but a managerial transformation that redefines decision-making processes, leadership roles, and organizational culture.

Overall, the responses confirm that Moroccan banks perceive AI as both a technological enabler and a managerial lever. This dual function aligns with the conceptual framework developed in this study, highlighting the interplay between external pressures for innovation and internal dynamics of organizational adaptation.

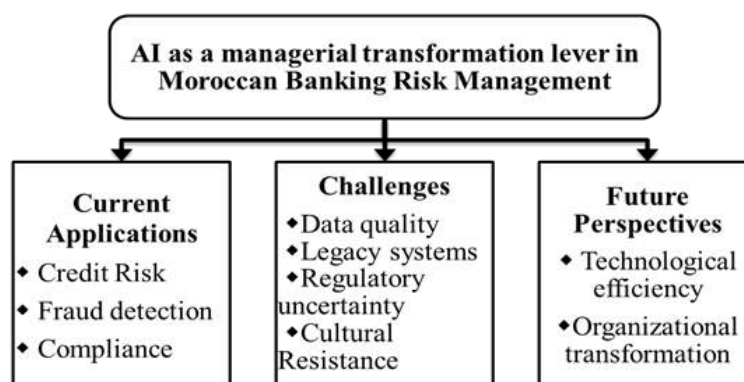
5. Discussion

Overall, the interviews with AWB, BCP, and BOA reveal that AI adoption in Moroccan banking risk management is progressing unevenly yet steadily, driven by competitive pressures and regulatory imperatives. Current applications—credit risk assessment, fraud detection, and compliance monitoring—align with global trends while reflecting local constraints, notably deficiencies in data quality, outdated infrastructures, regulatory ambiguities, and cultural resistance.

These findings, reinforced by the literature and illustrated in the conceptual model (Figure 4), highlight AI's dual role: as a technological enabler of efficiency and as a managerial lever for organizational transformation. Moving beyond a purely technological focus, effective adoption requires integrated managerial strategies centered on workforce reskilling, employee engagement, and cross-functional collaboration.

More broadly, the Moroccan case underscores the potential of AI in emerging economies to catalyze institutional change when adoption strategies are embedded in governance, risk culture, and long-term strategic vision. In this perspective, AI is not merely a technological tool, but a driver of resilience, adaptability, and competitive advantage in an increasingly uncertain financial environment.

Figure 4: Conceptual Model: AI as a Managerial Lever in Moroccan Banking Risk Management



Source: Author's elaboration

6. Conclusion

In the digital age, following numerous global crises—including the 2007-2008 subprime crisis and the Covid-19 pandemic—financial institutions, particularly banks, are compelled to reorganize their management models and renew their risk control systems. They must rise to the challenges posed by emerging technologies such as artificial intelligence (AI) and Robotic Process Automation (RPA), while responding to intensified competition—a matter of particular interest to central banks due to their regulatory role.

Technological progress shows no signs of slowing, and AI development is expected to continue unabated. AI is increasingly regarded as a promising field with the potential to partially or fully replace human capital within banking organizations, which may intensify social phenomena such as unemployment. Simultaneously, banks anticipate significant growth opportunities from

these technologies, which drive large-scale sector development, although the abstract and complex nature of AI remains a barrier to adoption.

Morocco is currently experiencing unprecedented momentum in AI, especially within the financial and banking sectors, where this technological revolution is profoundly transforming practices. AI is becoming more accessible and intuitive, emerging as an essential capability for organizations, particularly banks. According to some studies, financial institutions are expected to double their AI-related expenditures by 2027 (Kearns, 2023), with projections suggesting that by 2030, AI could enable the banking sector to save nearly one trillion dollars (Joyce, 2018).

Undoubtedly, intelligent finance and accounting represents the future development trend. Promoting AI in accounting requires coordinated efforts from the state, enterprises, universities, individuals, and other stakeholders, with effective solutions to emerging challenges being key (Luo et al., 2018).

As emphasized by Ashta and Mogha (2023), digital transformation and AI adoption are mutually reinforcing processes that generate novel risks, which must be carefully integrated into governance frameworks. They further stress the urgency of developing an integrated strategy that combines technological solutions, ethical imperatives, and appropriate regulatory measures — an approach that should be contextually adapted to Moroccan banks.

Finally, this underscores the critical need for Moroccan banks not only to acknowledge the dual nature of AI as both an opportunity and a source of risk, but also to advance research and practical approaches in designing governance models that ensure resilience and sustainability in the digital era.

References :

- (1). Amzile, K., & Amzile, R. (2021). L'utilisation de la méthode KPV émanant de l'intelligence artificielle pour la prédiction de la solvabilité des clients bancaires. *Revue du contrôle, de la comptabilité et de l'audit*, 5(4), 110–123.
- (2). Ashta, A., & Mogha, V. (2023). The risks of innovation: The case of artificial intelligence. *Technology Innovation*, 8(1), 1–14.
- (3). Benazzi, S., & Rouiessi, I. (2017). Analyse de la concurrence bancaire au Maroc : Approche de Panzar et Rosse. Document de travail, Bank Al-Maghrib, Département de la Recherche.
- (4). Bhattacharya, C., & Sinha, M. (2022). The role of AI in banking for leveraging customer experience. *Australasian Accounting, Business and Finance Journal*, 16(5).
- (5). Bellaaj, M. (2023, May 5–7). Opportunités et défis de l'intelligence artificielle pour les banques : un regard à travers ChatGPT. In *Tunisia-International Conference on Economics, Finance and Accounting: Financial Inclusion and Fintech Revolution – Covid-19 Lessons*.
- (6). Benhamou, S., Janin, L., Bocognano, A., Charrié, J., & Thibault, G. (2018). *Intelligence artificielle et travail*. Paris: France Stratégie , 90.
- (7). Bostrom, N. (2024). *Superintelligence*. Paris: Dunod.
- (8). Braun, V., & Clarke, V. (2006). Using thematic analysis in psychology. *Qualitative Research in Psychology*, 3(2), 77–101.
- (9). Castanet, C., & Planes, C. (2018). Finance et intelligence artificielle : une révolution en marche. *Annales des Mines – Enjeux numériques*, 1(1), 15–21.
- (10). Doua, E. (2022). Enjeux et pratiques de l'intelligence artificielle dans le secteur bancaire en Côte d'Ivoire : Analyse à la lumière de la Société Générale de Banque de la Côte d'Ivoire (SG-CI). *Communication, technologies et développement*, (11).

- (11). El Ouidani, R., & Oul-Caid, M. (2023). L'adoption de l'IA dans le secteur bancaire marocain : Entre enjeux économiques et enjeux juridiques. *Journal d'économie, de management, d'environnement et de droit*, 6(1), 37–56.
- (12). El Ouidani, R., Outouzzalt, A., & Bengrich, M. (2023). L'adoption de l'intelligence artificielle dans le secteur bancaire au Maroc : Perspectives des employés sur les facteurs individuels influents. *Repères et perspectives économiques*, 7(2).
- (13). European Banking Authority. (2019). Risk assessment questionnaire – Summary of the results.
<https://www.eba.europa.eu/documents/10180/2854739/RAQ+Booklet+Spring+2019.pdf/9167099-4aba-ac1f-882cfd4c3583>
- (14). Espinoza, F. E. T., & Ygnacio, M. A. C. (2023). Credit risk assessment models in financial technology: A review. *TecnoLógicas*, 26(58), e2679.
<https://doi.org/10.22430/22565337.2679>
- (15). Gigante, G., & Zago, A. (2022). DARQ technologies in the financial sector: Artificial intelligence applications in personalized banking. *Qualitative Research in Financial Markets*.
- (16). Guyader, H. (2021). Comment les systèmes d'intelligence artificielle réduisent les risques de crédit. *Évolution & Transformation*. <https://www.evolution-transformation.fr/comment-les-systemes-dintelligence-artificielle-reduisent-les-risques-de-credit/>
- (17). Haloui, S., Abourmane, K., & Taouab, O. (2018). La digitalisation de la relation client, un nouveau dispositif pour le management des risques : Cas de deux banques marocaines. *Revue du contrôle, de la comptabilité et de l'audit*, 2(3), 75–97.
- (18). He, X., Zhang, C., Zhang, L., & Li, X. (2016). A-optimal projection for image representation. *IEEE Transactions on Pattern Analysis and Machine Intelligence*, 38(5), 1009–1015.
- (19). Joyce, L. (2018). AI and the banking industry's \$1 trillion opportunity. *The Financial Brand*. <https://thefinancialbrand.com/news/data-analytics-banking/artificial-intelligence-trends-banking-industry-72653/>
- (20). Kearns, J. (2023). L'intelligence artificielle et le secteur financier. *IMF Finance et Développement Magazine*.
<https://www.imf.org/fr/Publications/fandd/issues/2023/12/AI-reverberations-across-finance-Kearns>
- (21). Li, X., Guo, Q., & Lu, X. (2016). Spatiotemporal statistics for video quality assessment. *IEEE Transactions on Image Processing*, 25(7), 3329–3342.
- (22). Luo, C., Zeng, J., Yuan, M., Dai, W., & Yang, Q. (2016). Telco user activity level prediction with massive mobile broadband data. *ACM Transactions on Intelligent Systems and Technology*, 7(4), 1–30.
- (23). Luo, J. X., Meng, Q. J., & Cai, Y. (2018). Analysis of the impact of artificial intelligence application on the development of accounting industry. *Open Journal of Business and Management*, 6(4), 850–856.
- (24). Mateu, J. B., & Pluchart, J. J. (2019). L'économie de l'intelligence artificielle. *Revue d'économie financière*, (3), 257–272.
- (25). McNally, N., & Bastos, M. (2025). The news feed is not a black box: A longitudinal study of Facebook's algorithmic treatment of news. *Digital Journalism*, 1–20.
<https://doi.org/10.1080/21670811.2025.2450623>
- (26). Milojević, N., & Redzepagic, S. (2021). Prospects of artificial intelligence and machine learning application in banking risk management. *Journal of Central Banking Theory and Practice*, 10(3), 41–57. <https://doi.org/10.2478/jcbtp-2021-0023>

- (27). Senden, A., & Henrard, L. (2021). L'intelligence artificielle et la robotic process automation au service de la gestion des risques dans le secteur bancaire : Tendances et défis. Université catholique de Louvain – Louvain School of Management.
- (28). Servan-Schreiber, E. (2018). Supercollectif : La nouvelle puissance de nos intelligences. Paris: Fayard.
- (29). Portnoff, A., & Soupizet, J. (2018). Intelligence artificielle : Opportunités et risques. *Futuribles*, 426, 5–26. <https://doi.org/10.3917/futur.426.0005>
- (30). Thomas, M. (2018). 5 applications de l'IA dans le secteur bancaire. Kolabtree Blog. <https://www.kolabtree.com/blog/5-applications-de-lia-dans-le-secteur-bancaire/>
- (31). Turing, A. (1950). Computing machinery and intelligence. *Mind*, 59(236), 433–460. <https://doi.org/10.1093/mind/LIX.236.433>
- (32). Wu, X., Kumar, V., Ross Quinlan, J., Ghosh, J., Yang, Q., Motoda, H., ... & Steinberg, D. (2008). Top 10 algorithms in data mining. *Knowledge and information systems*, 14(1), 1-37.
- (33). Yaseen, H., & Al-Amarneh, A. (2025). Adoption of artificial intelligence-driven fraud detection in banking: The role of trust, transparency, and fairness perception in financial institutions in the United Arab Emirates and Qatar. *Journal of Risk and Financial Management*, 18(4), 217. <https://doi.org/10.3390/jrfm18040217>
- (34). Yska, S., Bustos, D., & Guedes, J. C. (2023). Machine learning applications for continuous improvement in integrated management systems: A short review. In *Studies in Systems, Decision and Control* (Vol. 449, pp. 541–551). Springer.
- (35). Zahraoui, O., & Jallouli, O. (2021). Paiement numérique en temps de Covid-19 au Maroc : Vers une évolution durable? *Revue française d'économie et de gestion*, 2(5).
- (36). Zhang, S., Li, X., Zong, M., Zhu, X., & Cheng, D. (2017). Learning k for kNN classification. *ACM Transactions on Intelligent Systems and Technology*, 8(3), 1–19.
- (37). Zhu, X., Li, X., & Zhang, S. (2016). Block-row sparse multiview multilabel learning for image classification. *IEEE Transactions on Cybernetics*, 46(2), 450–461.