Ministry of Higher Education and Scientific Research,

University Center Sheikh Amoud Ben Mokhtar, Illizi

Institute of Law

Graduation Thesis for the Master's Degree in Law, Specialization Entitled

The Legal Role of Artificial Intelligence in The Banking Sector

Under the supervision Professor:

Nadjette Hamlaoui

Prepared by the Student:

Djeriri Lalla Aicha

The Examination Committee consists of the following professors

Hamel Fadila	Professor, University Center of Illizi	Chair
Nadjette Hamlaoui	Professor, University Center of Illizi	Supervisor and Rapporteur
Humaida Imad	Professor, University Center of Illizi	Examiner

Academic Year 2025/2026

Dedication:

I dedicate this research work to my beloved parents, for their endless love, sacrifices, prayers, and support throughout my life.

To my husband and his parents, I express my sincere gratitude for their continuous encouragement, understanding, and support during this journey.

To my sisters and brothers, thank you for your motivation, kindness, and constant presence beside me.

I would also like to thank my teachers and supervisor for their valuable guidance and assistance throughout this work.

Finally, I dedicate this work to everyone who contributed, directly or indirectly, to the completion of this research.

Abbreviations:

AI	Artificial Intelligence
BS	Banking Sector
AML	Anti Money Laundering
Fin Tech	Financial Technology
EU	European Union
GDPR	General Data Protection Regulation

General introduction:

The world is currently undergoing a digital transformation driven by rapid technological advancements.

Among the most influential of these technologies is “Artificial Intelligence” (AI), which has emerged as a key tool in reshaping various economic sectors.

The banking and financial industries are particularly affected as AI technologies are increasingly integrated into financial services, customer interactions, and risk assessment.

AI offers numerous advantages to banks, such as improving operational efficiency, reducing costs, and enhancing decision accuracy.

However, this technological evolution also raises complex legal challenges, especially concerning civil liability, consumer protection, data privacy, and algorithmic transparency. The ability of AI systems to operate autonomously, learn from data, and make independent decisions may lead to harmful consequences.

Therefore, legal scholars and policymakers are questioning whether the current legal frameworks are sufficient to regulate the use of AI in the banking sector, or whether new legal principles and regulations are needed. This debate is particularly relevant in “civil law jurisdictions” where liability attribution is traditionally based on fault causation, and legal personality concepts that are increasingly tested by the rise of autonomous technology. In this context, this research aims to examine the “legal implications of introducing AI into banking activities with a focus on private law mechanisms.”

The importance of this subject:

1. **Scientific value:**

   The study of this topic helps to understand how technological innovation influences banking operations and raises new legal and ethical considerations. It also provides a scientific contribution to the modernization of banking practices and the development of approximate legal frameworks.

2. **Objectives of the study:**

   ⇒ To examine the role of AI in improving banking services.

   ⇒ To identify applications of AI in banking.

   ⇒ To explore legal and ethical challenges of using AI.

   ⇒ To suggest ways or methods for effective and responsible AI use in banking.

3. **Objective reasons:**

   ⇒ The fast and rapid development of AI.

   ⇒ The need to improve operational efficiency, reduce errors, and enhance customer service.

   ⇒ The emergence of new legal challenges related to AI use in financial institutions.

4. **Personal reasons**

   The subject was chosen due to its relevance to my previous academic background, as I am an English teacher.
   Previous studies on the subject: several studies have discussed the role of AI in the banking sector, such as:

   a. Doctorate-level research:

   Noureddine Imene Faculty: Economics and Management Sciences University of Eloued

   Advancements in fintech and AI. Transformation in the Arab financial and Banking sector.

b. Master's thesis: Mbarki yasmine ben kehida samia the reality of the Financial and banking sector case study of Al Salam Bank of Msila.

5. **Research problem:**

To what extent can artificial intelligence be effectively and responsibly integrated into Algerian banks while addressing the operational, legal, and ethical challenges associated with its implementation?

6. **Research methodology:**

⇒ This study relies on descriptive analytical methodology to examine AI applications in Algerian banks and their impact on performance.

⇒ It also employs a comparative method to learn from international practices and a legal analytical approach to address the legal and ethical challenges of AI in banking

7. **Scope of the study:**

This study is limited to the Algerian banking sector, focusing on major commercial banks that have adopted or are beginning to adopt AI technologies in their operations. The study concentrates on the legal, ethical, and technical aspects of AI applications without delving into macro-economic issues or national financial policies. The time frame covered is the last 7 years (2018_2025) to reflect recent developments in the field.

8. **Difficulties and challenges:**

⇒ Limited local specialized sources (few Algerian studies are available on AI)

⇒ Challenges in accessing banking data.

⇒ Legal challenges: the absence of a clear and comprehensive legal framework.

The enrollment of the study:

Based on the main problem raised for the research and the methods adopted to study it. We divided this study. In two chapters, each chapter included two topics.

The first chapter deals with the. We discuss in the first section the conceptual definition of the legal nature and applications of AI in banking, and in the legal regulation and responsibility for AI in banking.

Chapter One: The legal nature and applications of AI banking.

Introduction:

Artificial Intelligence (AI) has significantly transformed the banking sector by automating processes, enhancing risk management, and improving customer experience. This study explores the theoretical and legal framework of Artificial Intelligence (AI) and its applications in the banking sector, while also examining the opportunities and challenges associated with its implementation.

First, the study introduces the concept of Artificial Intelligence and its fundamental principles, with an analysis of existing legal and regulatory frameworks, particularly European AI legislation and data protection laws such as the General Data Protection Regulation (GDPR). It then discusses the role of AI in banking through enhancing operational efficiency, improving customer services, and reinforcing cybersecurity, while addressing issues related to algorithmic bias and regulatory compliance. Furthermore, the study highlights examples of AI applications in both international and Algerian banking systems. Finally, it analyzes the future prospects and challenges of AI in Algeria, emphasizing the development opportunities created by the ongoing digital transformation of the banking sector.

Section One: The Concept and Legal Nature of Artificial Intelligence

1. Definition and characteristics of Artificial Intelligence

a. Definition of Intelligence:

Intelligence may be defined as the ability to learn and apply appropriate techniques to solve problems and achieve goals within a constantly changing and uncertain environment.[1]

[1] HAI Stanford university Human-centered Artificial Intelligence.

b. Definition of Artificial Intelligence:

Artificial Intelligence (AI) refers to the use of computer systems capable of performing tasks and generating outputs that normally require human intelligence, especially through the application of machine learning techniques to large datasets.According to National Aeronautics and Space Administration (NASA), AI refers to systems capable of carrying out complex tasks that normally involve human reasoning, decision-making, and creativity. There is no single universally accepted definition of Artificial Intelligence, as AI systems are designed to perform a wide range of functions. However, many definitions converge on the idea that AI involves systems capable of operating under dynamic and unpredictable conditions with minimal human intervention, while continuously learning from data and improving their performance over time.

> AI systems may be implemented in software, hardware, or hybrid forms, and are generally designed to perform tasks requiring human-like capabilities such as perception, cognition, planning, learning, communication, and physical interaction. These systems may also be described as technologies that simulate human thinking or act rationally to achieve specific goals through processes such as reasoning, learning, and decision-making.

The term “Artificial Intelligence” was first introduced by John McCarthy in 1955, who defined it as “the science and engineering of making intelligent machines.” While early research focused on programming machines to behave intelligently in specific tasks, modern AI emphasizes systems that can learn and adapt in ways that resemble human learning processes.

c.Definition of machine learning and deep learning:

Artificial intelligence has many parts and one of them is called machine learning, well I am sure you heard about it, and about deep learning. Well they're very different from each other.

Machine learning is how a computer agent improves its learning, thinking, and performance of work based on the experience of given data.[2]

While deep learning is a distinct approach that can be considered as a machine learning method, it is currently the most successful approach, describing the use of large, multi-layer neural networks that compute with continuous representations, a little like the organized neurons in the human brain.[3]

2. Characteristics of AI:

An analysis of artificial intelligence reveals that it simulates human intelligence and is characterized by several features, including the ability to learn, solve problems, and make decisions with the required accuracy and speed, these aspects may be further clarified through the following points:

a. **Use of knowledge:** means the ability to apply knowledge to specific activities to address specific issues. Or, in another way, reasoning and decision-making. At the core of an AI system lies its reasoning module, which takes the given data as input data and proposes an action to take and gives the goal to achieve. This means that the data collected needs to be transformed into information that the reasoning module can understand.

   Notice: the term" decision" should be considered broadly, as any act of selecting the action to take, and does not necessarily mean

[2] goodfellow i. bengio y. & courville a. (2016). deep learning. mit press p 99
[3] goodfellow i. bengio y. & courville a. (2016). deep learning. Mit press same reference p371

that AI systems are completely autonomous. A decision can also be the selection of a recommendation to be provided to a human being, who will be the final decision maker.

b. **The Ability to Reason:** This refers to the capacity of artificial intelligence systems to analyze data, identify the causes of problems, and generate effective solutions within a short time. AI relies on logical and computational reasoning to process information and support decision-making efficiently.

c. **Reliance on Experimental Learning**
Artificial intelligence systems depend on learning from data and previous experiences to address new problems and developments. When no ready-made logical solution exists, AI can generate possible outcomes and improve its decisions through continuous analysis of large amounts of data at speeds beyond human capability.

d. **The Ability to Provide Solutions**
Based on the information entered by the user, AI systems can quickly suggest solutions and recommendations. However, the accuracy of these solutions depends on the quality and completeness of the available information; limited or insufficient data may reduce the precision of the final results.

e. **Autonomy and Increased Efficiency**
Artificial intelligence can operate continuously without fatigue or boredom, allowing it to perform tasks with high speed and accuracy. AI systems are also characterized by a degree of autonomy, enabling them to make decisions and draw conclusions independently by relying on extensive stored data and advanced analytical capabilities.

f. **The Development of Artificial Intelligence and Automation**
The evolution of artificial intelligence and automation has advanced significantly since the mid-twentieth century. During the 1950s and 1960s, AI research focused on experiments related

to natural language processing and strategic games such as chess. The work of Alan Turing, particularly the Turing Test, became a major milestone in evaluating machine intelligence. These early achievements encouraged researchers to explore techniques including heuristic algorithms and neural networks.[4]

Definition of Automation: The Ability to Reason

This refers to the capacity of artificial intelligence systems to analyze data, identify the causes of problems, and generate effective solutions within a short time. AI relies on logical and computational reasoning to process information and support decision-making efficiently.[5]

Reliance on Experimental Learning

Artificial intelligence systems depend on learning from data and previous experiences to address new problems and developments. When no ready-made logical solution exists, AI can generate possible outcomes and improve its decisions through continuous analysis of large amounts of data at speeds beyond human capability.

The Ability to Provide Solutions

Based on the information entered by the user, AI systems can quickly suggest solutions and recommendations. However, the accuracy of these solutions depends on the quality and completeness of the available information; limited or insufficient data may reduce the precision of the final results.

Autonomy and Increased Efficiency

Artificial intelligence can operate continuously without fatigue or boredom, allowing it to perform tasks with high speed and accuracy. AI systems are also characterized by a degree of

[4] International Journal of Society Reviews (INJOSER) Vol. 3 No. 1, January 2025, pages: 166~173 e-ISSN: 3030-802X 166 AI AND AUTOMATION IN THE DIGITAL ERA: A LITERATURE REVIEW OF TECHNOLOGY DEVELOPMENT AND REGULATION Loso Judijanto IPOSS Jakarta, Indonesia universitas Satya Wiyata Mandala.

[5] Automation by GEORGIA VAN TOORN, CHRIS O'NEILL, MAITREYA SHAH, and MARK ANDREJEVIC page 107.

autonomy, enabling them to make decisions and draw conclusions independently by relying on extensive stored data and advanced analytical capabilities.

The Development of Artificial Intelligence and Automation

The evolution of artificial intelligence and automation has advanced significantly since the mid-twentieth century. During the 1950s and 1960s, AI research focused on experiments related to natural language processing and strategic games such as chess. The work of Alan Turing, particularly the Turing Test, became a major milestone in evaluating machine intelligence. These early achievements encouraged researchers to explore techniques including heuristic algorithms and neural networks.

Definition of Automation

Automation refers to the use of machines, software, and technological systems to perform tasks automatically with minimal or no human intervention.

2. Distinction between AI, automation, and digital systems

A.Complexity and Flexibility:

Automation is generally governed by rigid rules to perform specific, repetitive actions without deviation. It does not "learn" but strictly follows a predetermined script. AI, however, is characterized by its ability to evolve; it analyzes data to improve and make independent choices. This allows AI to tackle diverse problems and adjust to new circumstances it wasn't specifically programmed to handle.

b.Range of Use:

Automation is typically reserved for tasks that demand high precision and consistency in predictable environments. In contrast, AI is applied to complex fields requiring human-like judgment, such as pattern recognition, speech processing, interpreting intricate data, or forecasting trends.

c.Technical Basis:

While automation can be as simple as a basic mechanical tool or a software script, AI is built on advanced algorithms and theories, such as neural networks and natural language processing, to execute tasks that require cognitive reasoning.

d.Primary Objectives:

The goal of automation is to carry out a specific function with perfect reliability and repetition. The objective of AI is to simulate human behavior and perform tasks in a manner that appears thoughtful or intelligent.

3. The legal status of AI systems in private law

Until recently, AI was spoken of exclusively as an object of law. But today, the question of the possibility of granting legal personality and personal rights to what yesterday was perceived only as a computer program is being discussed in doctrine and practice. Currency, in its physical form, consists of banknotes and coins. It can also take a digital form and is called the Central Bank Digital Currency (the Algerian Digital Dinar).The State has the exclusive right to issue currency within the national territory. This right is delegated to the Central Bank, referred to herein as the Bank of Algeria, and is subject to the provisions of this law.

1. Legal Personality and Categorization

Artificial intelligence emerges as a significant outcome of the information revolution. Its defining feature is the capacity to swiftly analyze data and perform research, thereby assisting legal practitioners in formulating precise and thorough legal strategies. Nonetheless, the efficacy of this technology is contingent upon the breadth of the database containing the legal documents and materials it utilizes. Furthermore, it has demonstrated remarkable efficiency and speed in

handling routine and repetitive tasks, including the review of contracts, documents, and conducting legal research (Drabel, 2022).[6]

Acquiring legal personality is crucial, especially concerning the acquisition of rights and the assumption of obligations. As is known, legal personality according to Algerian civil law, is established for a human being upon the successful birth and ceases upon death. This means that a person has the capacity to acquire rights and assume obligations. Upon reaching the age of 19, an individual gains full capacity to act, allowing them to engage in all legal acts and bear full legal responsibility. Regarding legal entities, Article of the civil code stipulates that upon acquiring legal personality, as outlined in Article of the same code, rights become capable of acquisition, and obligations can be assumed, including liability for damages caused to others. Thus, an intelligent system is neither a human nor a legal entity to be granted natural or legal personality. Since the system is connected to a tangible carrier (hardware), it does not fall under natural or legal persons and possesses a unique nature that makes it exempt from the legal personality framework of the applicable legal system11 . From a doctrinal perspective, scholars have diverged on this issue. Some reject the idea of granting legal personality to artificial intelligence, asserting that legal personality is a concept created by humans to organize human relationships, making it unreasonable to apply it to virtual persons or robots. They argue that such recognition would absolve the manufacturer of responsibility12[7] . Conversely, others advocate for recognizing legal personality for virtual persons and robots, based on the notion that “all humans are persons, but not all persons are humans.” Consequently, the characteristics of artificial intelligence extend beyond merely being considered an object or machine. Its programming enables it to act and react, prompting legal scholars to propose granting it virtual

[6] Casey, A., & Lemley, M. 2019. “you might be a robot” cornell law review.
[7] Surden, H. (2019). “Artificial Intelligence and Legal Responsibility”

personality, as society needs to clarify its legal status to fulfill obligations and acquire certain rights within its nature.[8]

2. Civil Liability for AI use

Civil Liability for Artificial Intelligence (AI)Civil liability is a cornerstone of civil law, as it serves to protect individual rights. At its essence, it mandates that any party causing harm to another must provide compensation once specific legal conditions are met. This principle is upheld by various legal frameworks, such as Article 163 of the Egyptian Civil Code and Article 227 of the Kuwaiti Civil Code, both of which state that any wrongful act causing damage to others obligates the perpetrator to compensate for it. In general terms, civil liability is the legal obligation to redress harm resulting from a breach of duty. With the rapid advancement of Artificial Intelligence and its integration into various sectors, legal scholars are now examining how these technologies fit into traditional liability frameworks. Types of Liability in the Context of AIThe use of AI—whether through physical robots or digital systems—can potentially cause harm to users. According to general legal principles (such as Article 124 of the [relevant] Civil Code), such harm must be compensated. Civil liability in this context is [9]typically categorized into two types based on its origin:

1.Contractual Liability

This type of liability is triggered when a party fails to fulfill their contractual obligations, whether through non-performance, delay, or if the contract is invalidated by fraud or lack of consent. For liability to be established, the electronic contract

[8] CIVIL LIABILITY FOR THE USE OF THE ARTIFICIAL INTELLIGENCE SYSTEM SAMIRA ABED1 1Faculty of Law, Badji Mokhtar University of Annaba (Algeria) Published: 20/04/2025.

[9] Annals of Algiers University 1 Volume: 39 - N°04 -2025 P:96 -114 Corresponding author: MEHDA Djelloul, mehda-djelloul@univ-eloued.dz. 96 Legal Provisions Governing Civil Liability for the Use of Artificial Intelligence Applications أحكام قيام المسؤولية المدنية عن استعمال برامج الذكاء الاصطناعيMehda Djelloul1 1Echahid Hamma Lakhdar University – El Oued, Algeria Published: December /2025.

must be legally sound. In cases involving AI-driven products—like robots or software—where specific AI legislation may be absent, general sales contract laws are applied. Alternatively, liability can be based on consumer protection and product safety standards for non-conforming goods, both of which serve as grounds for seeking compensation and legal redress.

2.Liability Based on Product Safety and Consumer Protection: Some legal experts trace AI-related liability back to manufacturing defects; had the defect been known, the contract would not have been finalized. Consequently, the manufacturer is responsible for compensating consumers for such flaws, often viewed as a breach of safety protocols. Depending on the jurisdiction, this liability may extend to the distributor. Under certain civil codes (like Article 140 bis), AI can be classified as a "product" (tangible or intangible movable property) once it enters the market. However, AI's autonomous decision-making capabilities—independent of human operators—can make it challenging to apply traditional product liability frameworks, which typically target the manufacturing entity.

1. **Strict Liability :**

The primary objective of civil liability is to ensure that victims receive fair compensation for any harm suffered. However, the emergence of Artificial Intelligence (AI) has complicated traditional legal frameworks, making it difficult to determine who is at fault for damages caused by these systems. To address this, legal scholars propose a shift toward Strict Liability in the context of AI. Under this principle: Nature of Activity: AI use is often classified as a "dangerous or abnormal activity," justifying a departure from traditional fault-based systems. Proof of Fault: Unlike standard liability, the injured party does not need to prove negligence or intent. They only need to establish a causal link between the AI's actions and the damage incurred.Legal Protection: This framework prioritizes victim protection by

removing the burden of proving the defendant's fault, ensuring compensation even if the activity was conducted correctly.This approach is supported by international precedents, such as the European Directive (No. 374/85/EEC) issued in 1985, which established producer liability based on the principle of liability without fault.

Section Two: uses of AI in banking operations

Artificial Intelligence Artificial Intelligence is widely used in banking operations to improve efficiency, accuracy, and customer experience. In banking, AI is applied in several key areas such as fraud detection, where it analyzes transaction patterns to identify suspicious activities in real time, and credit scoring, where it evaluates customer data to assess loan eligibility more accurately. It is also used in customer service through chatbots and virtual assistants that provide 24/7 support, as well as in risk management by predicting financial risks and market trends. Additionally, AI supports anti-money laundering (AML) systems by monitoring transactions for illegal activities and helps in automating routine back-office tasks, reducing operational costs and human error.

1. AI in customer service and digital banking

In an age marked by accelerated technological progress, Artificial Intelligence (AI) has emerged as a transformative driver across multiple sectors, notably the banking industry. As financial services undergo continuous digital transformation, the adoption of AI within digital banking systems has become a key mechanism for providing tailored customer experiences. This study explores the significant influence of AI-driven personalization in digital banking, highlighting its contribution to improving customer satisfaction and expanding financial inclusion. The integration of AI with digital banking enables financial institutions to effectively process and interpret extensive volumes of customer data, yielding valuable insights into user

behaviors, preferences, and expectations. By leveraging advanced machine learning models and analytical algorithms, banks can perform real-time data analysis to design highly customized services. These capabilities range from individualized product offerings to personalized financial guidance, ultimately reshaping customer–bank interactions and strengthening trust and long-term customer loyalty.[10]

Artificial Intelligence (AI) is being used across the financial services industry, and is becoming more popular in customer - facing digital channels. Broadly speaking, AI involves 'the ability of machines to emulate human thinking, reasoning and decision - making' (eMarketer). As well as being driven by consumer demand and a need to cut costs, AI is emerging in financial services as banks enjoy better access to improved technology and lower costs for processing tools and data storage than ever before. However, as Nanette Byrnes writes in the Technology Review, 'despite rapid progress in the technologies collectively known as artificial intelligence —pattern recognition, natural language processing, image recognition, and hypothesis generation, among others —there still remains a long way to go.'

experts in digital banking research – provides insights and analysis on customer experience to financial services providers. With a wide range of live bank accounts, Mapa analysts replicate and record the customer journey, on mobile devices and desktop. This helps businesses understand the competitive landscape, and offers inspiration for digital projects and improvements. This free report takes a look at the world of artificial intelligence and digital banking, with a few examples taken from our ongoing research. For a more detailed overview of this topic, or analysis of specific competitors.[11]

[10] Transforming Digital Banking with Artificial Intelligence: Elevating Customer Experience and Advancing Financial Inclusion Published Nov. 21, 2025 By Neha Prajapati Gunjan Baheti.

[11] Artificial Intelligence and Digital Banking mapa powerpoint presentation, November 2016.

The adoption of AI-driven frameworks has revolutionized digital banking, significantly enhancing both user interaction and operational productivity. Research from the IEEE Globecom Workshops [5] highlights that AI-integrated banking interfaces, utilizing beyond-5G tech, have achieved near-perfect system reliability (99.999%). These sophisticated systems leverage neural networks to analyze and adapt to individual user habits, resulting in highly tailored banking experiences. This shift toward personalization is a cornerstone of modern finance, employing intricate algorithms to decode client preferences. Consequently, AI-driven customization has reached 85% accuracy in forecasting client needs, boosting engagement by 54%. Furthermore, studies like the AVA system [6] show that AI chatbots now manage up to 85% of customer inquiries independently, maintaining over 92% satisfaction rates. These tools provide 24/7 support with consistent quality. Finally, merging AI with legacy infrastructure has optimized resource management and predictive service, cutting customer wait times by 45% while strengthening security via advanced biometric systems."

2. AI in credit scoring and risk assessment

A. Process Automation:

The integration of Robotic Process Automation (RPA) has radically enhanced operational productivity and service delivery within the banking sector[12]. Research from the IEEE International Conference on Industrial Engineering and Operations Management indicates that banks adopting comprehensive automation have seen substantial gains in operational performance. Specifically, automated systems have cut transaction processing times by 65% and boosted accuracy to 99.98%, marking a major leap over conventional manual workflows. The evolution of transaction automation now

[12] World bank. (2022) digital financial services and risk management.

includes advanced AI algorithms capable of managing intricate financial tasks in real-time. Modern systems can process upwards of 100,000 transactions per second while ensuring total data consistency and adherence to regulations[13]. This shift has led to a 73% drop in processing expenses and a 68% reduction in errors, fundamentally reshaping bank efficiency. Furthermore, Intelligent Automation has revolutionized document management. By utilizing OCR and NLP, modern platforms can automatically identify and process data from diverse documents. Studies show these automated systems reduce handling time by 92% and improve accuracy to 97%, allowing banks to manage larger workloads without increasing resources.In terms of Compliance and Monitoring, automation has significantly lowered risks. Automated reporting systems have achieved a 75% decrease in compliance breaches and a 65% reduction in oversight costs. Finally, intelligent resource allocation has driven a 45% improvement in overall operational efficiency and a 38% reduction in operational costs. These systems dynamically adjust resource allocation based on real-time demand patterns, ensuring optimal distribution of banking resources across various services and channels. Legal implications of automated banking decisions.[14]

B. Risk and Security:

The landscape of banking risk management and security has been significantly upgraded through advancements in automated detection and prevention. Recent studies in digital security emphasize that contemporary fraud detection systems now reach accuracy rates above 95%, while keeping false positives under 0.1%. These frameworks utilize complex machine learning algorithms that proactively adapt to new fraud trends, allowing

[13] European Banking Auhority (EBA) (2022) Report on big Data and advanced analytics in Finance.

[14] AI in Banking: Transforming Customer Experience and Operational Efficiency Venkata Krishna Reddy Kovvuri Infosys Limited, USA

for the early identification and prevention of threats. Furthermore, credit risk evaluation has been revolutionized by high-level analytics and machine learning. Modern systems process vast amounts of both structured and unstructured data to assess creditworthiness with remarkable precision. Financial institutions adopting these technologies report a 62% boost in risk prediction accuracy and a 45% decrease in default rates. By incorporating alternative data and real-time market indicators, banks can now conduct more thorough risk assessments, leading to improved lending choices and minimized portfolio risks. Additionally, Anti-Money Laundering (AML) systems have integrated advanced pattern recognition and behavioral analysis. Current AML platforms can analyze millions of transactions at once, identifying suspicious activities with 92% accuracy. Implementing these systems has cut investigation times by 75% and improved detection rates for suspicious behavior by 65%. Consequently, banks are seeing better regulatory compliance and reduced exposure to financial crimes, while data protection and privacy protocols have become more resilient against sophisticated cyber threats requirements. Contemporary banking infrastructures utilize multi-faceted security protocols, encompassing sophisticated encryption, biometric verification, and behavioral monitoring. Studies show that institutions adopting these extensive frameworks see a 62% reduction in security breaches and sustain customer trust ratings exceeding 95%. Implementing AI-driven security has facilitated instantaneous threat identification and automated mitigation, drastically curtailing the consequences of potential data leaks. As operational efficiency and risk management in banking progress alongside technological breakthroughs, the fusion of quantum computing and high-level AI algorithms is set to deliver even more refined risk evaluation and safety measures. Financial institutions that prioritize integrated automation and

security systems exhibit superior operational results, securing a long-term competitive edge in the digital banking landscape[15]

[15] World bank (2022) Digital Financial Services and Risk Management same reference

Chapter one abstract :

Artificial intelligence (AI) is transforming the banking sector by enhancing operational efficiency, improving risk management, and reshaping customer experience through automation and data-driven decision-making. This study examines the theoretical foundations of AI, its legal nature, and its regulatory treatment, with a focus on both international frameworks and the evolving Algerian legal context. It explores key definitions of artificial intelligence, machine learning, and deep learning, while distinguishing AI from automation and digital systems. The research further analyzes the legal status of AI in private law, emphasizing that AI is generally considered a technological tool without legal personality, with liability attributed to natural or legal persons such as developers, users, and financial institutions.

The study also investigates civil and contractual liability related to AI systems, particularly in cases of errors, bias, or malfunction causing financial or personal harm. It highlights the challenges of proving damages in AI-related disputes and discusses the application of traditional liability principles, including tort liability, contractual liability, product liability, and strict liability. Furthermore, it examines the concept of “custody of things” as a potential framework for attributing responsibility in AI-related damages.

In addition, the research explores the practical applications of AI in banking, including fraud detection, credit scoring, risk assessment, anti-money laundering systems, customer service automation, and digital banking services. It demonstrates how AI improves efficiency and personalization while also introducing legal and ethical challenges such as algorithmic bias, transparency issues, and regulatory gaps.

Finally, the study addresses the emerging legal and regulatory landscape in Algeria, where AI is not yet governed by a dedicated

legal framework but is instead regulated through general civil law, banking regulations, and data protection laws. The research concludes by emphasizing the need for future legal reforms to adapt liability regimes and regulatory structures to the growing integration of artificial intelligence in the banking sector.

Chapter two: Legal Regulation and responsibility for Ai in banking

Introduction:

The integration of Artificial Intelligence (AI) into the banking sector has introduced significant advancements in efficiency and decision-making, while simultaneously raising complex legal challenges. Existing regulatory frameworks, initially designed for traditional banking activities, are increasingly inadequate to address issues related to transparency, data protection, and accountability. Consequently, modern legal approaches combine financial regulation with instruments such as the General Data Protection Regulation and the EU AI Act.

This chapter examines the legal regulation of AI in banking and analyzes the allocation of responsibility among the various actors involved, with particular emphasis on ensuring accountability and the protection of consumers.

Section one: the legal framework governing AI in banking

The legal framework governing Artificial Intelligence (AI) in the banking sector is evolving in response to the growing use of automated systems in financial services. While traditional banking regulations continue to apply, they are increasingly complemented by data protection rules such as the General Data Protection Regulation and emerging AI-specific instruments like the EU AI Act. This framework aims to ensure that the deployment of AI in banking aligns with principles of transparency, accountability, and consumer protection.

1. National and international instruments:

Unlike the EU, **Algeria does not yet have a specific AI law**. Instead, AI in banking is governed through a **combination of existing laws** on:

- Banking regulation
- Data protection
- Digital transformation
- Financial security

1.1. Core National Legal Instruments :

In Algeria, the main legal framework governing the banking sector is established by the Monetary and Banking Law (Law No. 23-09 of 2023), which reinforces the overall governance of banks, strengthens the role of the Central Bank, and introduces clearer regulation of digital banking activities. This framework is particularly important for artificial intelligence because it explicitly encompasses digital banks and fintech services, thereby extending regulatory oversight to emerging technologies. As a result, public authorities are empowered to supervise and control the use of innovative tools within the financial system.

Consequently, AI applications in banking—such as fraud detection, credit scoring, and risk assessment—fall under this general regulatory supervision, even in the absence of a specific AI law.[16]

Regulation No. 24-04 on digital banks establishes the legal conditions for the creation and operation of fully digital banking institutions, including those relying on advanced technologies such as artificial intelligence. A key principle of this regulation is that digital banks are subject to the same legal and prudential requirements as traditional banks, ensuring regulatory consistency across the sector. This means that the use of AI does not create a legal loophole or exemption; instead, AI-based systems remain fully governed under existing banking rules. Consequently, technologies such as automated decision-making, fraud detection, or algorithmic risk assessment are supervised within the same regulatory framework that applies to conventional banking activities.[17]

2. The role of data protection laws

In Algeria, Law No. 18-07 on the protection of personal data represents the fundamental legal framework governing privacy and data governance. It sets out strict rules for how personal information must be collected, processed, stored, and eventually deleted by both public and private entities, including banks and financial institutions. The law is based on core principles such as lawfulness, purpose limitation, data minimization, and security, meaning that personal data can only be used for clearly defined and legitimate purposes, and must not be retained longer than

[16] قانون رقم 23-09 مؤرخ في 3 ذي الحجة عام 1444 الموافق 12 يونيو سنة 2023، يتضمن القانون النقدي والمصرفي.

[17] La Banque d'Algérie fixe les conditions de création de banques digitales radio algerienne

necessary. It also requires explicit or informed consent from individuals before their data can be processed, except in specific legally defined cases.

This framework is particularly important for artificial intelligence in banking because AI systems depend heavily on large volumes of sensitive customer data, including credit histories, transaction behavior, identity documents, and sometimes behavioral patterns used for risk analysis and fraud detection. Under Law 18-07, banks using AI must ensure that data is collected transparently, stored securely, and processed in a way that respects individuals' rights. The law also grants individuals rights such as access to their data, correction of inaccurate information, and in some cases objection to automated processing.

Additionally, the law introduces institutional oversight through a national data protection authority, which is responsible for monitoring compliance and enforcing sanctions in case of violations. This is particularly relevant for AI systems that may involve automated decision-making, as it ensures that such technologies remain accountable and do not operate outside legal control. Overall, Law 18-07 plays a central role in shaping how AI can be safely integrated into the Algerian banking sector by ensuring privacy, transparency, and regulatory supervision.[18]

3. The need for new regulations adapted to AI

In Algeria, the governance of artificial intelligence is still in an early and developing stage, mainly guided by emerging policy initiatives rather than fully binding AI-specific legislation. One

[18] القانون رقم 18-07 كضمانة لحماية البيانات الشخصية في المعالجة الآلية وتطبيقات الذكاء الاصطناعي المالي نحو شمول مالي آمن ناصر زواولة

of the most important steps in this direction is the **National Artificial Intelligence Strategy (2024–2030)**, which outlines Algeria's roadmap for integrating AI across different sectors, including strategic areas such as finance and banking. This strategy reflects the country's ambition to modernize its economy by promoting innovation, supporting digital transformation, and encouraging the adoption of AI technologies in both public and private institutions.

A key objective of this strategy is to develop AI capabilities nationally while also strengthening **regulatory and institutional capacity**, meaning that Algeria is preparing its legal and technical environment to better supervise and manage AI systems in the future. This includes improving expertise in data governance, cybersecurity, and ethical AI use, which are essential for high-impact sectors like banking where AI is increasingly used for credit scoring, fraud detection, and risk management.

However, despite its importance, this strategy remains at the **policy level and is not legally binding**, meaning it does not yet impose direct obligations on banks or companies. As a result, Algeria currently relies on existing laws—such as banking regulations and data protection rules—to indirectly govern AI use, while gradually moving toward a more structured and dedicated AI regulatory framework in the future.[19]

[19] تنظيم الذكاء الاصطناعي الناشئ في الجزائر: الموازنة بين الابتكار والمساءلة- https://algeriatech.news/ar/ai-regulation-governance-framework-algeria-2026-ar

Section two: liability and consumer protection

The use of Artificial Intelligence in banking raises important issues of liability and consumer protection, particularly due to automated decision-making that directly affects customers. Banks remain primarily liable for the outcomes of AI systems, as they retain a duty of care toward their clients, even when relying on automated tools. However, liability may also extend to developers or service providers in cases of technical defects, leading to a shared responsibility model.

In terms of consumer protection, the use of AI requires compliance with principles of transparency, fairness, and non-discrimination. Legal frameworks such as the General Data Protection Regulation and the EU AI Act reinforce these protections by limiting purely automated decisions and ensuring human oversight.

1. Civil and contractual liability of banks using AI :

The civil and contractual liability of banks using artificial intelligence (AI) is primarily governed by general principles of civil law and banking regulation, and there is currently no specific legal framework dedicated exclusively to AI liability. The Algerian Civil Code (Ordonnance n° 75-58) establishes the general principle of civil liability, according to which any person who causes damage to another is required to repair it. This fundamental rule forms the legal basis for holding banks responsible for harm arising from their activities, regardless of whether the damage is caused by human actions or automated systems. Accordingly, if an AI system used by a bank results in harm—such as incorrect credit scoring, unjustified account blocking, fraud detection errors, or discriminatory outcomes—the bank may still incur civil liability once damage is proven, including financial loss or infringement of customer rights.

From a contractual perspective, banking relationships are based on legally binding agreements between the bank and its clients, such as account contracts, loan agreements, and digital banking service contracts. Under general contractual principles of Algerian civil law, banks are bound to properly execute their obligations, whether they are obligations of means or result depending on the service provided. Therefore, any failure resulting from the use of AI systems—such as refusal of legitimate transactions or errors in credit processing—constitutes a breach of contractual obligations for which the bank remains responsible, regardless of whether the process was carried out by human staff or automated technologies.

This approach is reinforced by the Monetary and Banking Law (Law No. 23-09 of 2023), which governs banking institutions and emphasizes their responsibility for the proper execution of services, customer protection, and operational risk management. It confirms that banks remain fully accountable for all banking operations, including those conducted through digital platforms and emerging technologies, with no legal exemption granted for the use of automated or AI-based systems.

In addition, Law No. 18-07 on the protection of personal data requires banks to ensure the lawful, secure, and transparent processing of personal information. Since AI systems rely heavily on customer data, banks may be held responsible for any harm resulting from misuse, inadequate protection, or failure of systems processing sensitive data.

Overall, AI systems are legally considered tools under the control of the bank rather than independent legal entities. As a result, banks cannot avoid liability by attributing faults to algorithms or automated decision-making systems. Instead, they are expected to implement appropriate governance measures, including

supervision, risk management, and internal controls, ensuring full compliance with their civil, contractual, and regulatory obligations.[20]

2. Responsibility for damages caused by AI errors or bias

In the field of artificial intelligence, individuals negatively impacted by AI operations encounter formidable obstacles, primarily regarding the requirement to prove both mechanical defects and the resulting harm. Standard evidentiary procedures—including documentation, witness testimony, admissions, and expert opinions—are essential; however, methods like direct evidence or traditional oaths are often impractical when dealing with intelligent systems. This analysis aims to define the responsibilities necessary to simplify the process of proving damages, especially considering the vulnerable position of the affected party. Under tort liability, an individual is held accountable whenever they breach the general legal duty to avoid harming others through a specific wrongful act. As specified in Article 124 of the Algerian Civil Code, tort liability arises from an act involving fault, damage, and a direct causal link between them. Fault may result from negligence or a failure to comply with legal obligations, such as traffic laws. Essentially, tort liability involves a breach of legal duty, representing a deviation from the expected behavior of a "reasonable person." Establishing fault requires three components: the material element (the act of deviation or aggression), the moral element (responsibility and discernment), and the subsequent damage. In the context of AI, the current legal presumption often assumes these systems are inherently defect-free, which places the heavy burden of proof entirely on the

[20] Algerian Civil Code (Ordonnance n° 75-58), Law No. 23-09 of 2023 (Monetary and Banking Law) and Algerian Civil Code (contract law principles)

plaintiff. To establish liability, the aggrieved party must prove three foundational elements: fault, damage, and a causal relationship Personality Artificial Intelligence (AI) focuses on creating machines capable of performing tasks that typically require human intelligence, such as mimicking cognitive processes. As AI systems become more integrated into society, determining the legal nature of AI-related damages is crucial. A significant debate exists among scholars regarding whether AI should be granted legal personality. Proponents argue that granting AI rights and obligations would make them directly liable for their actions. Opponents contend that this would blur the line between humans and objects, potentially threatening human existence. Currently, AI is classified as an object, meaning legal accountability rests with the human creators or operators. Identifying the specific cause of damage is difficult due to the complexity of AI-generated actions. Consequently, many legal scholars advocate for the doctrine of object liability. Under this principle, the "guardian" of the AI—the entity with use, direction, and control over it—is held legally responsible for any harm caused.The Case of Self-Driving CarsAutonomous vehicles illustrate these challenges. They operate via AI programs that process environmental data to execute commands. However, proving damage under object liability remains difficult, particularly when trying to identify the true legal guardian who exercised actual control over the system at the time of the incident. "Legal precedents generally identify the 'guardian' as the individual or entity maintaining effective command over an AI system. This concept of guardianship highlights the importance of physical control, which complicates legal recovery for damages caused by AI. While French civil law does not explicitly define a 'thing,' jurisprudence has traditionally characterized it as a non-living, physical entity, though this may extend to non-sentient living beings.Because AI consists of software designed

> to mimic human cognition, it is often classified under intellectual property laws rather than being treated as a physical 'thing.' This distinction is vital in determining whether AI is a tangible asset or a financial right. Many legal scholars challenge the 'thing' classification for AI, arguing that its capacity for autonomous learning links it more to the virtual realm than the physical one.The debate over whether AI qualifies as a 'thing' for liability purposes remains intense. While physical robots might fit traditional definitions, the intangible nature of AI software does not align with current laws tailored for physical objects. Even if we consider the underlying hardware as the 'thing,' significant hurdles remain—most notably the autonomous nature of AI, which frequently functions beyond direct human intervention.
>
> The most formidable obstacle is the autonomous nature of AI, which frequently functions outside of direct human oversight. According to general strict liability rules, establishing a guardian's responsibility necessitates demonstrating either an external factor or a proactive measure that could have prevented the harm. This prerequisite hinders the evidentiary process and shifts the focus away from providing restitution to the injured party.[21]

In the context of artificial intelligence, individuals affected by AI-driven decisions face significant legal and evidentiary challenges, particularly in proving the existence of defects in the system, the resulting damage, and the causal link between them. Unlike traditional forms of liability, direct evidence is often difficult to obtain from intelligent systems, making conventional methods of proof—such as documentation, expert reports, legal presumptions, and technical

[21] Law and Political Science Journal Responsibility and Proving Damages Caused by Artificial Intelligence Dr. Ouafi Hadja Real Estate and Environmental Law Laboratory Faculty of Law and Political Science Abdelhamid Ibn Badis University, Mostaganem hadja.ouafi@univ-mosta.dz

analysis—essential in establishing responsibility, while confession or direct testimony from the "machine" is impossible.

Under Algerian civil law, tort liability is based on Article 124 of the Civil Code, which establishes that liability arises from fault, damage, and a causal relationship between them. Fault may result from negligence or failure to comply with legal obligations, and it generally reflects a deviation from the behavior expected of a reasonable person. In the case of AI systems, fault may manifest through algorithmic errors, biased outputs, or malfunctioning automated processes that lead to harmful consequences such as incorrect credit scoring, discriminatory decisions, or wrongful denial of banking services.

A central difficulty in AI-related liability lies in determining proof, as the default assumption is that AI systems operate without inherent "fault" in the legal sense. This places a heavier burden on the injured party, who must demonstrate that the damage resulted from a defect in the system or from improper human supervision. The required proof involves establishing the existence of damage, identifying the malfunction or error in the AI system, and proving the causal link between the two.

Scholarly debate further complicates this issue, particularly regarding the legal nature of artificial intelligence. Some legal scholars argue in favor of granting AI systems legal personality, which would allow them to bear rights and obligations and be directly responsible for the damages they cause. However, this position is widely contested on the grounds that it blurs the distinction between human beings and objects and raises concerns about legal and ethical responsibility. As a result, the dominant view treats AI as an object under human control, with liability ultimately falling on humans, such as developers, operators, or institutions deploying the system.

Within this framework, liability is often analyzed through the doctrine of "custody of things" (responsabilité du fait des choses), where the custodian of the AI system—the entity exercising use, control, and supervision—is held responsible for damages caused by the system. This is particularly relevant in complex applications such as autonomous vehicles or banking algorithms, where multiple actors (programmers, institutions, and users) may be involved, making it difficult to isolate the exact source of fault. In such cases, courts generally focus on the entity that exercises effective control over the AI system.

The classification of AI itself remains a contested legal issue. While some argue that AI could be treated as a "thing" under object liability rules, others highlight its intangible and autonomous nature, which distinguishes it from traditional physical objects. Artificial intelligence is fundamentally composed of software systems capable of learning, adapting, and making decisions based on data processing, which places it closer to the digital or intellectual domain rather than the physical one. This raises difficulties in applying traditional liability frameworks designed primarily for tangible objects.

Moreover, AI systems often operate with a high degree of autonomy, reducing direct human intervention and complicating the identification of a responsible party. Under object liability principles, establishing responsibility typically requires proving control over the object and the ability to prevent harm. However, the adaptive and evolving nature of AI systems challenges this assumption, as decisions may be generated through complex algorithms that are not fully predictable even by their creators.

Ultimately, responsibility for damages caused by AI errors or bias remains grounded in traditional principles of civil liability, where human actors—rather than the AI itself—bear legal responsibility. This ensures that affected individuals retain the right to compensation,

while reinforcing the obligation of developers, operators, and institutions to ensure proper design, supervision, and control of artificial intelligence systems to prevent harm.

3. Protecting consumer rights in AI based banking services:

3.1. Legal Framework for Consumer Protection in Algeria:

Consumer rights in AI-based banking services are protected indirectly through a combination of **banking regulation, consumer protection law, and data protection rules**, rather than a dedicated AI law.

A key legal instrument is **Law No. 09-03 on Consumer Protection and Fraud Repression**, which guarantees that consumers must be treated fairly and protected from misleading or harmful practices in the provision of goods and services, including financial services. This law establishes the principle that service providers must ensure transparency, safety, and fairness in all transactions, which is particularly relevant when AI systems are used in banking decisions such as credit scoring or automated approvals.

Additionally, the **Bank of Algeria's regulatory framework** strengthens consumer protection by requiring banks and financial institutions to ensure fairness, transparency, and respectful treatment of clients. Recent regulatory updates emphasize customer rights such as non-discrimination, ethical treatment, and protection of vulnerable consumers in financial services. [22]

3.2. Data Protection and AI-Driven Banking:

A major pillar of consumer protection in AI-based banking is **Law No. 18-07 on the Protection of Personal Data**.

[22] https://fadaa.dz/new-regulation-from-the-bank-of-algeria

This law regulates the collection, processing, and storage of personal data and is essential in AI systems that rely on customer information.
It guarantees:

- Prior consent for data processing
- Security and confidentiality of personal data
- Rights of access, correction, and objection for individuals
- Supervision by the National Authority for the Protection of Personal Data

This is particularly important in AI banking because algorithms depend on sensitive data such as credit history, financial behavior, and identity information. Any misuse or algorithmic bias affecting this data may trigger legal responsibility under this framework.

3.3. AI and the Issue of Fairness, Bias, and Transparency:

AI systems in banking (such as credit scoring or fraud detection tools) raise important consumer protection concerns, especially regarding:

- Algorithmic bias
- Lack of transparency (“black-box decisions”)
- Automated rejection of financial services

Although Algeria has no AI-specific liability law, Article 124 of the Civil Code and general contractual principles ensure that banks remain responsible for harmful outcomes caused by their systems. This means that consumers can seek compensation if AI-based decisions cause financial or moral damage, provided fault and causality are established.

4. Juridical approaches and possible legal reforms

In Algeria, the legal treatment of liability and consumer protection in AI-based banking services is currently grounded in traditional legal doctrines rather than a dedicated artificial intelligence regulatory framework. As artificial intelligence becomes increasingly integrated into banking operations—particularly in credit scoring, fraud detection, customer profiling, and automated decision-making—the Algerian legal system continues to rely on general principles of civil liability, contractual responsibility, consumer protection law, and data protection regulations to address disputes arising from AI systems. This means that, rather than treating AI as a distinct legal category, Algerian law applies existing legal rules designed for human or institutional conduct to situations involving automated technologies.

The foundation of liability in Algerian law is the Civil Code, particularly Article 124 of Ordinance No. 75-58, which establishes the principle of tort liability. According to this provision, any act that causes harm to another obliges the person responsible to repair the damage. This general principle remains the primary legal basis for addressing AI-related harm in banking services. Since AI systems do not have legal personality, responsibility cannot be attributed to the algorithm itself. Instead, liability is assigned to legal or natural persons such as banks, developers, operators, or service providers who deploy or supervise the system. Consequently, if an AI system produces harmful outcomes—such as incorrect credit decisions, wrongful account restrictions, or discriminatory financial profiling—the bank may still be held responsible if fault, damage, and causation are established.

In addition to tort liability, contractual liability plays a crucial role in protecting consumers in AI-based banking services. The relationship between banks and customers is fundamentally contractual, whether it involves account opening, credit agreements, or digital banking services. Under Algerian civil law principles, banks are bound to execute their contractual obligations properly, regardless of whether these obligations are performed by human employees or automated AI systems. Therefore, if an AI-based system fails to properly execute a banking service—for example, by rejecting a legitimate transaction or miscalculating credit eligibility—it may constitute a breach of contract, triggering liability for non-performance or improper performance. This reinforces the idea that AI does not alter the legal nature of banking obligations but rather serves as a technical tool within an existing contractual framework.

Consumer protection law further strengthens this framework. Law No. 09-03 on Consumer Protection and Fraud Repression, as amended by Law No. 18-09, establishes essential rights for consumers, including protection against unfair practices, misleading services, and unsafe products. In the context of AI-based banking, this law ensures that consumers are protected from unfair algorithmic practices that may arise from automated decision-making systems. For example, if an AI system produces biased or opaque decisions that negatively affect consumers, such practices may be interpreted as violations of fairness and transparency obligations under consumer protection law. This is particularly relevant in financial services, where consumers are often considered the weaker party in the contractual relationship.

Another essential pillar of consumer protection in AI-based banking is Law No. 18-07 on the protection of personal data.

This law regulates the collection, processing, storage, and use of personal data, which is fundamental for AI systems operating in banking environments. AI technologies rely heavily on large datasets, including financial history, transaction behavior, identity information, and credit records. Therefore, banks must ensure that data processing is lawful, secure, and transparent. The law also grants individuals rights such as access to their personal data, correction of inaccurate information, and protection against unauthorized use. In AI-based banking systems, compliance with data protection law is essential to ensure that automated decisions are based on legally obtained and properly processed data.

Despite these legal safeguards, the current framework reveals significant limitations. One of the main challenges is the difficulty of proving liability in AI-related disputes. Unlike traditional banking errors, AI systems often operate as "black boxes," making it difficult for consumers to understand how decisions are made. This creates an evidentiary imbalance between banks and consumers, as individuals may struggle to demonstrate the existence of a defect, fault, or causal link between the AI system and the harm suffered. As a result, the burden of proof often falls heavily on the injured party, making legal recourse more complex.

Another limitation is the absence of specific legislation governing artificial intelligence. Algerian law does not yet recognize AI as a separate legal category, nor does it establish specific liability rules for algorithmic systems. This leads to legal uncertainty, particularly in cases involving automated decision-making or algorithmic bias. While existing laws provide a general framework, they were not designed to address the complexity, autonomy, and opacity of modern AI systems.

As a result, legal scholars and policymakers increasingly emphasize the need for reform. Proposed legal approaches include the introduction of specific AI liability rules, the adoption of stricter or presumed liability regimes for high-risk AI systems, and the establishment of transparency obligations requiring explainability of automated decisions. There is also growing discussion on strengthening consumer rights, particularly the right to human intervention in automated decisions and the right to contest algorithmic outcomes. Additionally, regulatory reforms could include the creation of specialized supervisory authorities to oversee AI deployment in sensitive sectors such as banking.

4.1. Existing Juridical Approaches:

The current Algerian legal system primarily applies **fault-based civil liability** under the Civil Code (Ordonnance n° 75-58, Article 124), which requires proof of fault, damage, and a causal link. In AI-related banking disputes, this approach is often difficult to apply because algorithmic decisions may be opaque, automated, and technically complex. Consequently, liability is usually shifted toward banks or financial institutions as custodians of the systems they deploy.

In addition, **contractual liability principles** are applied in banking relationships, where banks are obligated to properly execute financial services regardless of whether the task is performed by human staff or AI systems. Consumer protection is also reinforced through **Law No. 09-03 on Consumer Protection**, while **Law No. 18-07 on Personal Data Protection** ensures that personal data used by AI systems is processed lawfully and securely. Together, these frameworks form an indirect but fragmented system of protection for consumers.

4.2. Limitations of the Current Legal Framework

Despite the existing legal protections provided by civil liability rules, consumer protection law, and data protection regulations, several significant legal gaps persist in the regulation of AI-based banking systems. One of the main challenges is the difficulty of proving fault in AI-related cases due to the "black box" nature of algorithms, which makes decision-making processes opaque and hard to interpret even for experts. In addition, there are no specific legal provisions addressing algorithmic bias or regulating automated decision-making in a detailed manner, which creates uncertainty when AI systems produce discriminatory or unfair outcomes. Another major issue is the lack of clarity in identifying the responsible party in cases of harm, as liability may potentially involve multiple actors such as the bank, software developers, data scientists, or system operators. Furthermore, current legal frameworks impose only limited obligations regarding transparency and explainability of AI systems, making it difficult for consumers to understand how decisions affecting them are made. Finally, there is no unified or comprehensive liability regime specifically designed to address damages caused by AI systems, resulting in fragmented legal responses. Taken together, these challenges demonstrate that traditional legal concepts, while still applicable, are increasingly insufficient to effectively regulate the complexities of AI-driven banking systems.

4.3. Possible Legal Reforms

To address these shortcomings, several legal reforms could be considered for Algeria to better regulate artificial intelligence in the

banking sector and strengthen both liability and consumer protection mechanisms. First, the introduction of a specific AI liability framework would be essential. Such a framework would establish a dedicated legal regime defining responsibility for damages caused by AI systems and would clearly allocate liability between banks, developers, software providers, and other actors involved in the design and deployment of AI technologies. This would reduce legal uncertainty and ensure more effective accountability in cases of harm.

Second, a shift toward presumed liability or strict liability could be introduced, particularly for high-risk AI applications such as credit scoring, fraud detection, and automated financial decision-making. Given the difficulty of proving fault due to the complexity and opacity of AI systems, these liability models would ease the burden of proof on consumers and ensure faster and more effective compensation for damages.

Third, strengthening transparency and explainability obligations would be a crucial reform. Banks could be legally required to ensure that AI-driven decisions are understandable, traceable, and auditable, especially when such decisions directly affect consumer rights. This would help reduce the risks associated with “black box” systems and increase trust in automated banking services.

Fourth, consumer rights in automated decision-making should be reinforced. Consumers could be granted explicit legal rights to contest decisions made by AI systems, request human intervention or review, and obtain clear explanations regarding the logic and data used in AI-based outcomes. These rights would enhance fairness and protect individuals from potentially harmful automated processes.

Finally, the creation of a specialized AI supervisory authority could be considered. This institution would oversee the development and use of artificial intelligence in sensitive sectors such as banking, ensuring compliance with ethical standards, legal obligations, and risk management requirements. It would also play a key role in monitoring algorithmic fairness, transparency, and accountability.

Overall, these reforms would help Algeria move from a fragmented regulatory approach toward a more coherent and adaptive legal framework capable of addressing the challenges posed by AI in the banking sector.

Chapter two abstract:

This chapter examines the legal regulation of artificial intelligence (AI) in the banking sector, focusing on liability and consumer protection within the Algerian legal framework. It highlights that although AI significantly enhances efficiency, decision-making, and digital transformation in banking, its integration raises complex legal challenges, particularly regarding accountability, transparency, and data protection. In Algeria, AI in banking is currently governed indirectly through existing legal instruments, including the Monetary and Banking Law (Law No. 23-09), Regulation No. 24-04 on digital banks, Law No. 18-07 on personal data protection, and general civil and contractual liability principles under the Civil Code (Ordonnance No. 75-58). These frameworks ensure that banks remain fully responsible for AI-driven operations, as AI systems are considered tools rather than independent legal entities.

The chapter further analyzes how civil and contractual liability apply to AI-related banking services, emphasizing that banks remain liable for damages caused by automated systems such as credit scoring errors, fraud detection failures, or discriminatory outcomes. It also explores tort liability under Article 124 of the Civil Code, which requires proof of fault, damage, and causation, while acknowledging the evidentiary difficulties posed by the “black box” nature of AI systems. Additionally, consumer protection is reinforced through Law No. 09-03 and data protection rules under Law No. 18-07, ensuring fairness, transparency, and lawful processing of personal data.

Finally, the chapter identifies key legal gaps, including the absence of a specific AI liability regime, difficulties in proving fault, uncertainty in attributing responsibility, and limited transparency obligations. It concludes by proposing legal reforms such as the establishment of a

dedicated AI liability framework, adoption of strict or presumed liability for high-risk systems, reinforcement of transparency and consumer rights, and the creation of a specialized AI supervisory authority. These reforms aim to build a more coherent and adaptive legal framework capable of addressing the evolving challenges of AI in banking.

Conclusion:

AI has become a pivotal technological advancement in the 2000s, fundamentally altering how the banking industry is organized and operated, profoundly reshaping the structure and functioning of the banking sector. Its integration into financial services is no longer a theoretical prospect but a concrete reality that influences daily banking operations, customer interactions, risk assessment mechanisms, and regulatory compliance systems. This chapter has examined the dual dimension of artificial intelligence: its legal nature and its practical applications within banking institutions, while also highlighting the regulatory challenges that arise from its increasing autonomy and complexity.

At the conceptual level, AI is most accurately defined as a field within computer science focused on creating systems that can mimic human intellectual abilities, including learning, logic, solving problems, and making choices. Despite the absence of a universally accepted definition, most doctrinal and institutional approaches converge on the idea that AI refers to systems capable of performing activities that usually necessitate human intellect. These frameworks encompass technologies like machine learning and deep, which allow continuous improvement through data analysis and experience. The evolution of AI from rule-based computational systems to adaptive, self-learning models has significantly increased both its efficiency and its unpredictability, particularly in sensitive domains such as banking.

From a legal perspective, artificial intelligence remains classified as a technological tool rather than a legal subject. It does not possess legal personality and therefore cannot independently bear rights or obligations. This classification is rooted in traditional legal theory, which links legal personality to human beings and, in some cases, legal entities created by law. As a result, responsibility for AI-driven actions is attributed to natural or legal persons, such as developers,

operators, financial institutions, or service providers. However, the increasing autonomy of AI systems challenges this traditional framework, as decision-making processes become less transparent and more difficult to trace. This raises fundamental legal questions regarding the attribution of liability, especially in cases involving financial harm, discriminatory outcomes, or system malfunctions.

The distinction between artificial intelligence, automation, and digital systems further clarifies its legal and functional specificity. Automation refers to the execution of predefined tasks without human intervention, following fixed rules and lacking adaptive capacity. Digital systems, on the other hand, operate on discrete data processing mechanisms and provide the technological infrastructure for modern information systems. Artificial intelligence, however, goes beyond both automation and digital processing by introducing adaptability, learning capabilities, and decision-making autonomy. This distinction is crucial from a legal standpoint because it demonstrates that AI cannot be treated under traditional frameworks governing mechanical automation or conventional software systems. Its ability to evolve and modify its behavior introduces new forms of legal uncertainty.

In banking operations, artificial intelligence has become a central tool for innovation and efficiency. It is widely used in fraud detection, credit scoring, customer service, risk management, anti-money laundering systems, and process automation. These applications have significantly improved operational efficiency by reducing processing times, minimizing human error, and enhancing predictive accuracy. For instance, AI-powered fraud detection systems are capable of analyzing millions of transactions in real time, identifying suspicious patterns with high accuracy. Similarly, credit scoring systems based on machine learning models enable more precise risk evaluation by incorporating alternative data sources and behavioral patterns. These

advancements contribute to more efficient financial systems and improved customer experiences.

One of the most visible applications of AI in banking is in customer service, where chatbots and virtual assistants provide continuous, personalized support. These systems rely on natural language processing to interact with customers, resolve queries, and guide users through banking services. The result is a more accessible and responsive banking environment, where customers benefit from faster service delivery and personalized financial recommendations. However, this transformation also raises concerns regarding transparency and accountability, particularly when automated systems make decisions that directly affect customer rights, such as loan approvals or account restrictions.

In addition, AI plays a critical role in risk assessment and credit analysis. Machine learning models are increasingly used to evaluate creditworthiness, detect financial risks, and predict market trends. While these systems enhance accuracy and efficiency, they also introduce new forms of risk, particularly algorithmic bias and opaque decision-making processes. If training data is biased or incomplete, AI systems may produce discriminatory outcomes, affecting fairness in financial services. This highlights the need for strong regulatory oversight and continuous monitoring of algorithmic systems in banking institutions.

From a legal standpoint, the integration of AI into banking raises complex issues related to civil liability, contractual obligations, and consumer protection. The fundamental principle governing liability in most legal systems, including Algerian law, is based on fault, damage, and causation. Under this framework, banks remain responsible for damages caused by their AI systems, even when decisions are made autonomously by algorithms. This is because AI systems are considered instruments under the control of the institution deploying

them. Therefore, banks cannot escape liability by attributing errors to technological systems.

Contractual liability also plays a significant role in regulating AI-based banking services. Banking relationships are founded on contractual obligations between banks and their clients. Any failure in service delivery, whether caused by human error or AI malfunction, constitutes a breach of contract. Consequently, banks are obligated to compensate customers for any harm resulting from incorrect automated decisions, such as erroneous credit assessments or unjustified transaction blocks. This reinforces the principle that technological innovation does not exempt financial institutions from their legal responsibilities.

In parallel, the doctrine of product liability and consumer protection may apply in cases involving defective AI systems. If an AI system is considered a product, liability may extend to manufacturers or developers in cases of design flaws or operational defects. However, the application of this doctrine remains complex due to the intangible and adaptive nature of artificial intelligence. Unlike traditional products, AI systems evolve over time, making it difficult to define a fixed point of defect or failure. This complexity necessitates the development of specialized legal frameworks adapted to the specific characteristics of AI technologies.

Another emerging legal approach is strict liability, which does not require proof of fault. Under this doctrine, liability arises solely from the existence of damage and its causal link to the activity in question. In the context of AI, strict liability is increasingly discussed due to the difficulty of proving fault in algorithmic decision-making processes. This approach ensures better protection for victims by shifting the burden of proof away from the injured party. However, it also raises concerns regarding fairness and the potential overburdening of institutions that deploy AI systems.

Conclusion

The question of legal personality for artificial intelligence remains a highly debated issue in legal doctrine. Some scholars argue that granting AI a form of legal personality could simplify liability issues by allowing direct attribution of responsibility to intelligent systems. Others reject this idea, emphasizing that legal personality is inherently linked to human existence and moral agency. The prevailing view maintains that AI should remain a legal object rather than a subject, with responsibility resting on human actors. This position ensures legal coherence while preserving accountability within existing legal structures.

Consumer protection is another critical dimension of AI regulation in banking. Customers are increasingly exposed to automated decision-making processes that may affect their financial status and access to essential services. Legal frameworks therefore emphasize principles of transparency, fairness, and non-discrimination. In particular, data protection laws play a fundamental role in regulating AI systems, as they govern the collection, processing, and storage of personal data used by algorithms. These laws ensure that customers retain control over their personal information and are protected against unauthorized or excessive data use.

Despite these existing legal mechanisms, current regulatory frameworks remain insufficient to fully address the challenges posed by artificial intelligence in banking. Most legal systems, including the Algerian framework, rely on general principles of civil law and sectoral regulations that were not designed to handle autonomous digital systems. This creates a regulatory gap that must be addressed through specialized legislation. Emerging international approaches, such as the European Union’s regulatory initiatives on AI, reflect a growing recognition of the need for comprehensive legal frameworks tailored to artificial intelligence.

Conclusion

In Algeria, efforts to regulate AI remain at an early stage, primarily guided by strategic policy documents and sectoral laws such as banking regulations and data protection legislation. While these instruments provide a foundational structure, they do not yet constitute a unified legal framework for artificial intelligence. The development of a national AI strategy indicates a clear intention to modernize the regulatory environment, but further legal reforms are necessary to ensure effective governance of AI systems in banking and other sensitive sectors.

In conclusion, artificial intelligence represents both a significant opportunity and a major legal challenge for the banking sector. It enhances efficiency, improves decision-making, and transforms customer experience, but it also introduces complex issues related to liability, transparency, and regulatory compliance. The current legal framework, while partially applicable, is not fully equipped to address the unique characteristics of AI systems. Therefore, future legal developments must aim to establish a balanced regulatory approach that encourages innovation while ensuring accountability and protecting fundamental rights. The evolution of AI in banking ultimately calls for a rethinking of traditional legal concepts, moving toward a more adaptive and technology-sensitive legal order capable of addressing the realities of the digital financial era.

Sources:

1. goodfellow i. bengio y. & courville a. (2016). deep learning. mit press p 99
2. Casey, A., & Lemley, M. 2019. “you might be a robot” cornell law review.
3. Surden, H. (2019). “Artificial Intelligence and Legal Responsibility”
4. CIVIL LIABILITY FOR THE USE OF THE ARTIFICIAL INTELLIGENCE SYSTEM SAMIRA ABED1 1Faculty of Law, Badji Mokhtar University of Annaba (Algeria) Published: 20/04/2025.
5. Transforming Digital Banking with Artificial Intelligence: Elevating Customer Experience and Advancing Financial Inclusion Published Nov. 21, 2025 By Neha Prajapati Gunjan Baheti.
6. Artificial Intelligence and Digital Banking mapa powerpoint presentation, November 2016.
7. AI in Banking: Transforming Customer Experience and Operational Efficiency Venkata Krishna Reddy Kovvuri Infosys Limited, USA
8. قانون رقم 23-09مؤرخ في 3ذي الحجة عام 1444الموافق 12يونيو سنة 2023، يتضمن القانون النقدي والمصرفي.
9. La Banque d'Algérie fixe les conditions de création de banques digitales radio algerienne
10. القانون رقم 18-07 كضمانة لحماية البيانات الشخصية في المعالجة الآلية وتطبيقات الذكاء الاصطناعي المالي نحو ناصر زواولة شمول مالي آمن
11. تنظيم الذكاء الاصطناعي الناشئ في الجزائر: الموازنة بين الابتكار والمساءلة https://algeriatech.news/ar/ai-regulation-governance-framework-algeria-2026-ar
12. Algerian Civil Code (Ordonnance n° 75-58), Law No. 23-09 of 2023 (Monetary and Banking Law) and Algerian Civil Code (contract law principles)
13. https://fadaa.dz/new-regulation-from-the-bank-of-algeria