Artificial Intelligence Applications as an Entry Point for Financial Inclusion in Banking Institutions - An Analytical Study of International Experiences-

KAMOUMIA Soufyane [*1], RAHEF imadeddine [2]

[1] Laboratory of Financial and Banking Systems and Macroeconomic Policies in Light of Global Transformations , University of Chlef (Algeria), s.kamoumia@univ-chlef.dz,

[2] Laboratory of Financial and Banking Systems and Macroeconomic Policies in Light of Global Transformations , University of Chlef (Algeria), i.rahef94@univ-chlef.dz,

Received (date) : 30/11/2025 Accepted (date): 08/04/2026 Published (date) 01/06/2026

Abstract:

This study aims to highlight the role that artificial intelligence can play as an entry point to promote financial inclusion in banking institutions, by analyzing applied models of leading banks such as the virtual "PayPal" bank, the Indian "ICICI" bank, and the Bahraini "ABC" bank. The study, using the deductive approach with its tools of verification and analysis, found that the reliance on artificial intelligence technologies, such as big data analysis, machine learning algorithms, and smart conversation assistants, has effectively contributed to expanding the customer base and reaching marginalized or financially excluded groups, especially in remote areas or among individuals not credit-rated. These technologies have also helped reduce operational costs and simplify procedures, making financial services more inclusive and flexible. The study recommended the necessity of developing a stimulating legislative and regulatory environment for adopting artificial intelligence in banking, alongside supporting digital innovation and building relevant institutional and human capacities

Key words: Artificial intelligence, financial inclusion, banking institutions.

Jel Classification Codes : G28, L16, O33

* Corresponding author

Introduction:

In light of the advanced digital revolution sweeping across various sectors globally, the banking sector has witnessed fundamental transformations over the past decade due to the digital revolution and the development of artificial intelligence technologies as one of the most important technological tools affecting various sectors, especially the banking and financial sector. Artificial intelligence is no longer limited to technical or industrial uses, but has extended to create a real revolution in the way banking services are designed and delivered through reliance on machine learning algorithms, big data analysis, and making accurate automated decisions based on behavioral patterns and real data. These developments have led to the emergence of a new trend in financial policies, which is the use of artificial intelligence as an effective means to promote financial inclusion, especially in societies that suffer from weak access to formal financial services.

Financial inclusion, as a key indicator of economic and social development, means enabling all individuals and groups, especially the marginalized, to access appropriate and affordable financial products and services in a fair and transparent manner. Despite the efforts made by financial and banking institutions and governments, the gap remains large between the financially included groups and those not included in the formal financial system. Here, artificial intelligence appears as a strategic tool that can be employed to bridge this gap through the innovative solutions it provides, allowing for overcoming the traditional obstacles that hinder financial inclusion, whether related to costs, risk assessment, or the lack of official documentation.

The experiences of a number of developing and developed countries have shown that integrating artificial intelligence technologies into the banking system has led to improved access to financial services, the development of alternative creditworthiness assessment systems, reduced transaction costs, and enhanced confidence in digital systems. This integration has also enabled the development of digital financial services tailored to vulnerable groups such as women, farmers, and rural residents by analyzing their informal financial behavior patterns and providing financial products that meet their actual needs.

These indicators also lead us to question whether banking institutions, including banks, are able to employ artificial intelligence to promote financial inclusion as required, especially in light of the legislative, regulatory, and structural challenges these institutions face.

This study highlights the growing role of artificial intelligence as a key entry point for promoting financial inclusion, especially in light of the challenges faced by traditional banking institutions in expanding towards underserved groups. By using technologies such as machine learning and big data analytics, global banking institutions such as PayPal, ICICI Bank, and ABC Bank Bahrain have been able to adopt innovative models for financial services and provide customized solutions that meet the needs of customers in different social environments.

The Main question: Based on the above, the problem of the study is defined in the following main question:

How can artificial intelligence contribute to enhancing financial inclusion in banking institutions, especially in PayPal Bank, ICICI Bank and ABC Bank Bahrain ?

The Sub-questions: The core question leads us to pose the following sub-questions:

- What is the concept of artificial intelligence and financial inclusion ?
- What is the importance of artificial intelligence in promoting financial inclusion in banking institutions ?
- What role does artificial intelligence play in promoting financial inclusion in the three banks under study ?

The Study Hypotheses: To attempt to answer the questions raised above, the following hypotheses were formulated:

- **First Hypothesis**: "The use of artificial intelligence contributes to expanding the scope of financial inclusion through the development of low-cost smart financial solutions",
- **Second Hypothesis**: "Artificial intelligence enhances financial inclusion in the three banking institutions under study."

Significance and Objectives of the Study: The significance of this study lies in its focus on a vital topic that combines technology and financial equity at a time when digital technologies have become a key driver of development. It also highlights a historic opportunity for banking institutions, particularly in countries with significant financial gaps, to leverage artificial intelligence (AI) as a means of compensating for weaknesses in traditional financial infrastructure. Furthermore, the study is of practical value as it provides decision-makers with a deeper understanding of the opportunities and challenges of applying AI to promote financial inclusion.

The study's objectives specifically focus on identifying the relationship between AI and financial inclusion within the banking context, monitoring the most important smart applications that enable financial institutions to reach new segments of the population, and assessing the impact of AI use on financial inclusion indicators in the three banks under study.

The Study Limitations: The study was limited by the following thematic, temporal, and spatial boundaries:

- **Thematic Limitations**: The study focused on the role of artificial intelligence in enhancing financial inclusion within the banking institutions under investigation, through an analysis of its mechanisms and practical applications.
- **Temporal Limitations**: The study spans the period 2015-2024, representing a period of intensive digital transformation in the financial sector and the experiences examined,
- **Spatial Limitations**: The study includes three international financial institutions in different environments: PayPal in the United States, ICICI Bank in India, and ABC Bank in Bahrain.

The Study Methodology: The nature of the subject, on the one hand, and the need to reach the research objectives and answer its problem, on the other hand, required us to rely on the deductive method with its two tools of description and analysis in preparing this research, in order to describe and understand the theoretical dimensions and analyze the applied dimensions of artificial intelligence in the banks under study, based on statistical data and reports issued by those institutions to analyze them and conclude the relationship between artificial intelligence and financial inclusion.

The Study structure: To cover the research topic, it was divided into the following sections:

1. The Concept of Artificial Intelligence and Financial Inclusion
1.1. The Concept of Artificial Intelligence;
1.2. The Concept of Financial Inclusion;
2. The Importance of Artificial Intelligence in Establishing Financial Inclusion;
2.1. The Most Prominent Applications of Artificial Intelligence Contributing to Supporting Financial Inclusion;
2.2. The Advantages and Disadvantages of Artificial Intelligence Contributing to Supporting Financial Inclusion;
3. An Analytical Study of the Role of Artificial Intelligence in Promoting Financial Inclusion in the Virtual Bank "PayPal", the Indian bank "ICCICI", and the Bahraini bank "ABC;"
3.1. The Experience of the Virtual Bank "PayPal" (US);
3.2. The Experience of the Indian bank "ICICI";
3.3. The Experience of the Bahraini bank "ABC".

1. The Concept of Artificial Intelligence and Financial Inclusion

1.1. The Concept of Artificial Intelligence: Before delving into the concept of artificial intelligence, we will provide a simple definition of intelligence, which is "the set of mental abilities that an individual uses to confront new situations and think systematically in research leading to inferential knowledge." Therefore, artificial intelligence has been defined by many researchers and writers as follows.

- O'Brien defined it as a science and technology based on a number of cognitive fields such as computer science, mathematics, biology, philosophy and engineering, which aims to develop computer functions to simulate human intelligence (Nouri, 2012, p. 142); so it is the various cognitive fields that interact together for the purpose of programming machines in a technical way that allows them to simulate human thought.
- Dan W. Patterson (an American professor and computer scientist specializing in artificial intelligence) defined it as a branch of computational science that is concerned with studying and forming computer systems that exhibit some forms of intelligence. These systems have the ability to provide useful inferences about the problem at hand. These systems can also understand natural languages or understand sensory perception and other capabilities that require intelligence when it is exhausted by humans (Muhammad M. A.-H., 2001, p. 84).
- Borana defined it as the ability of machines to perform activities such as judgment, knowledge, and control. It also includes understanding relationships, and these machines could represent the human brain of the future, functioning much like humans by performing all the tasks currently done by humans.
- It has also been defined as the set of theories and techniques used to produce machines capable of mimicking human intelligence. This is achieved by using powerful algorithms to provide efficient, reliable, and personalized answers to users through the combination of hardware and software. Artificial intelligence relies on the mobilization of multidisciplinary knowledge (Saidi, 2021, p. 274) .

Based on these previous definitions, artificial intelligence can be defined as "a branch of informatics that studies the development of intelligent algorithms and technologies for application in computers and robots, so that they possess intelligent behavior in performing tasks or in solving problems".

1.2. The Concept of Financial Inclusion: The term "financial inclusion" first appeared in 1993 in a study examining the state of financial services in southeast England. However, the concept did not gain widespread adoption until 1999, when it began to be used more broadly to refer to enabling individuals to effectively access available banking services (Nahla, 2021, p. 08).

This momentum continued with the United Nations' 2006 publication of the "Blue Book," which included guidelines for building inclusive financial sectors that take into account development goals. With the repercussions of the 2008 global financial crisis, financial inclusion acquired strategic importance, prompting many countries to adopt policies and procedures that facilitate financial access for all segments of society (Gharbi, 2020, p. 15).

The definitions provided for the concept of financial inclusion have varied according to international bodies and institutions. The World Bank defined it as enabling individuals and companies to access useful and affordable financial services that meet their needs (such as transactions, payments, savings, credit and insurance), provided that these services are provided in a responsible and sustainable manner (World-Bank, 2022), The Washington Center considered financial inclusion to be a state in which all able-bodied individuals can access a comprehensive set of high-quality financial services, at reasonable prices and in a convenient manner that aligns with their requirements)Hussein(124 صفحة، 2014 ،

In the same context, the Organisation for Economic Co-operation and Development (OECD), in partnership with the International Network for Financial Education (INFE), defined financial inclusion as a process aimed at promoting access to diverse and adequately regulated financial

services in terms of time and cost, while working to expand their use through innovative approaches that include financial education to achieve economic and social well-being (OECD/INFE, 2013) .

The G20, in collaboration with the Alliance for Financial Inclusion (AFI), also provided a definition that focuses on equitable access, stating that "financial inclusion is enabling all segments of society, including vulnerable and affluent groups, to access financial services that meet their needs, provided transparently and at an affordable cost" (Maouchi, 2020, p. 169), According to the Consultative Group to Assist the Poor (CGAP), "financial inclusion is about ensuring that lending, savings, payment and insurance services are available to all working-age adults through formal financial institutions" (Naimi, 2021, p. 382).

In addition, the Arab Monetary Fund defined financial inclusion as: "Providing quality and efficient financial services that meet the needs of all segments of society, with a focus on financially excluded groups, with the aim of promoting inclusive growth and financial stability" (Arab Monetary Fund, 2017, p. 8) .

The European Union, however, adopted a definition that focuses on financial exclusion, stating that financial inclusion is "enabling access to and effective use of basic financial services for all citizens, particularly those who face difficulties in dealing with the traditional financial system" (European Commission, 2008).

From an academic perspective, Mohammed Al-Sadiq Obeidat defines financial inclusion as: "The process of integrating financially marginalized groups into the formal banking system by providing a range of appropriate financial services that enhance their opportunities for development and a decent standard of living" (Muhammad A. A.-S., 2019, p. 56) .

Based on these definitions, a comprehensive definition of financial inclusion can be derived as: "Providing and making available formal financial services (such as savings, financing, transfers, insurance, and payments) to all members of society without discrimination based on income, geographical location, or gender, under accessible terms and acceptable quality, ensuring freedom of choice and effective access, thus contributing to financial justice, social inclusion, and sustainable economic development."

2. The importance of artificial intelligence in establishing financial inclusion

Artificial intelligence is one of the most prominent technological transformations in the modern era and has become an effective tool in developing financial systems and expanding the scope of services provided to the unbanked groups. In this context, its role has emerged as a key driver to support financial inclusion efforts through the opportunities it provides to enhance access to financial services, in contrast to technical, ethical, and regulatory challenges that require study. Its practical contribution is also evident in many applications that have brought about a qualitative shift in financial business models around the world.

2.1. Key AI Applications Contributing to Financial Inclusion : Recent years have witnessed a significant increase in interest in employing artificial intelligence within financial systems, not only to improve operational efficiency but also as a strategic means to achieve financial inclusion goals, especially in developing and marginalized societies. AI technologies have provided new opportunities to reach unbanked groups through advanced tools and techniques based on big data, machine learning, and behavioral prediction and analysis algorithms. The most prominent of these applications can be summarized as follows:

2.1.1. Alternative Credit Rating: Access to finance is one of the biggest challenges facing financial inclusion, especially in developing countries or among groups working in the informal economy who lack traditional credit records. In this context, artificial intelligence intervenes to revolutionize the concepts of creditworthiness assessment through "alternative models" that are based on exploiting unconventional data generated from individuals' daily activities.

Artificial intelligence uses machine learning techniques to extract patterns and hidden relationships between individuals' behaviors and creditworthiness indicators. Among the most prominent data sources used are mobile phone consumption patterns, informal financial

transactions, social media interaction, and digital payment records (such as phone and electricity bills). This data is integrated into analytical algorithms that enable the construction of an accurate credit profile that reflects the individual's true situation without the need for an official banking history (World Bank Group, 2020) .

2.1.2. Virtual Assistants and Chatbots: Artificial intelligence has radically changed the customer banking experience through virtual assistants powered by Natural Language Processing (NLP) technology, where customers can communicate with financial institutions via chat applications or text messaging platforms in their local languages and without any technical complexity.

These robots play a pivotal role in facilitating the understanding of financial services and simplifying complex processes such as opening accounts, checking balances, applying for loans, or even obtaining investment advice. This continuous interaction around the clock and seven days a week relieves pressure on bank branches and allows for coverage of remote or densely populated areas without the need for costly infrastructure (McKinsey & Company, 2019).

2.1.3. Early Detection of Financial Fraud (AI-Driven Fraud Detection): Trust is the backbone of financial inclusion and cannot be achieved without a security system capable of protecting transactions. This is where artificial intelligence (AI) comes in, offering advanced solutions in the field of financial cybersecurity. AI algorithms can analyze millions of transactions in real time to detect anomalous or suspicious activity.

These systems are built on deep learning techniques and neural network models that can identify hidden fraud patterns within massive amounts of data. When they detect unusual behavior—such as a sudden transfer of a large sum from an inactive account—the transaction is automatically stopped, and the user and the responsible party are notified (Arner, 2020, p. 67).

2.1.4. Tailored Financial Products: One of the biggest weaknesses of traditional financial services is their reliance on a "one-size-fits-all" approach. Artificial intelligence (AI) reverses this by analyzing customer preferences and behaviors to design products that align with their individual needs, using big data analytics techniques.

Fintech companies like Tala and Branch have achieved significant success in this area in Africa by offering personal loans based on smartphone data analysis (Ghosh, 2021, p. 10).

2.1.5. AI-Powered Digital Self-Service Banking: Self-service has revolutionized the way financial services are delivered, especially in environments with weak banking infrastructure. Artificial intelligence (AI) has enabled customers to conduct most financial transactions independently using dedicated mobile applications or online.

These services include: opening accounts, transferring funds, paying bills, instant lending, and even self-investing. Offered in a local language and with a simplified user interface, these services enhance accessibility for vulnerable groups who previously had no access to traditional banking systems.

The following global statistics illustrate AI adoption levels by region, along with some financial inclusion indicators and the percentage of individuals using smart financial applications, summarized in the table below:

Table (01): Global statistics on the use of artificial intelligence for financial inclusion purposes

Country/Region	Percentage of financial institutions that rely on artificial intelligence (%)	Most used app
United States	67 %	Fraud detection
European Union	54 %	Behavioral data analysis
China	72 %	Credit assessment
India	49 %	Automated customer service
Latin America	40 %	Smart payments
Middle East and	33 %	Biometric identity

North Africa			verification
Region	**2021**		**2023**
North America	72 %		81 %
Western Europe	68 %		77 %
East Asia and the Pacific	63 %		74 %
Sub-Saharan Africa	29 %		45 %
Middle East and North Africa	34 %		51 %
Target Audience	**Percentage of ownership of an official financial account (2021)**	**Percentage of digital services usage (2021)**	**Evolution compared to 2017**
Adults globally	76 %	57 %	+ 08 %
Women globally	72 %	51 %	+ 11 %
Low-income countries	55 %	37 %	+ 12 %
Sub-Saharan Africa	55 %	45 %	+ 14 %
Arab countries (medium)	48 %	31 %	+ 07 %

Source: (WorldBank Global Findex Database, 2021)

2.2. Advantages and disadvantages of artificial intelligence in achieving financial inclusion: Artificial intelligence is a pivotal tool in the development of the financial sector and has contributed significantly to enhancing financial inclusion by enabling institutions to provide accessible and tailored services to disadvantaged groups. However, the use of this technology is not without risks and challenges that require sound governance and strict regulatory intervention, The following is a detailed breakdown of the most important advantages and disadvantages:

2.2.1. Advantages of Artificial Intelligence in Achieving Financial Inclusion (Ben Azza. H, 2022, p. 192) .

2.2.1.1. Expanding Access to Financial Services: Artificial intelligence is an effective means of delivering financial services to remote and underserved areas through mobile applications and self-service systems that do not require traditional bank branches. This enables individuals to open accounts and conduct transactions without needing to travel, thus reducing geographical and financial barriers.

2.2.1.2. Data Analysis to Identify Customer Needs: Artificial intelligence technologies enable the analysis of big data about customers, such as spending behavior, household income, and transaction history, to provide personalized services, This analysis allows for the creation of financial products that suit different socioeconomic segments.

2.2.1.3 Reduced Operational Costs: Automating processes through artificial intelligence helps reduce costs associated with human resources and bank branches, enabling institutions to offer low-cost financial services to low-income customers, This operational efficiency supports financial sustainability and promotes wider adoption.

2.2.1.4. Improved Risk and Credit Management: Intelligent algorithms can assess the creditworthiness of unbanked individuals by analyzing non-traditional data such as mobile phone bills or payment patterns, paving the way for broader credit inclusion.

2.2.1.5. Combating Financial Fraud: AI tools are used to detect suspicious patterns and analyze user behavior in real time, allowing for early detection of fraud attempts and minimizing losses, which enhances user confidence.

2.2.1.6. Innovation in Products and Services: Artificial intelligence contributes to the design of innovative financial products such as digital microloans, online insurance, and services tailored to informal workers, enabling the inclusion of previously excluded groups in the financial system.

2.2.1.7. Supporting Financial Decision-Making: Through its predictive and decision-making capabilities, artificial intelligence helps financial institutions develop more effective strategies and enables individuals to access intelligent financial advice to improve their financial decisions.

2.2.2. The disadvantages of artificial intelligence in achieving financial inclusion: Despite the numerous benefits of artificial intelligence in promoting financial inclusion, there are some disadvantages that may accompany it. The most prominent of these disadvantages are as follows: (Ben Azza. H, 2022, p. 205).

2.2.2.1. Algorithmic Bias: AI algorithms may learn from historical data tainted by social or economic bias, leading to the reproduction of those biases in financial decisions. For example, women or rural populations may be unfairly assessed due to historical patterns in the data.

2.2.2.2. Privacy Violation: AI systems require access to sensitive and personal data such as income, geographic location, and consumption patterns. In the absence of strong data protection legislation, this data can be exploited or leaked, threatening individuals' trust in the digital financial system.

2.2.2.3. Digital Exclusion: The use of artificial intelligence tools requires users to possess digital skills and electronic devices, which are not available to everyone, especially in developing countries or impoverished areas. This exacerbates the digital divide rather than bridging it.

2.2.2.4. Over-Reliance on Technology: Complete reliance on intelligent systems may lead to automated decisions that disregard human or social contexts, such as automatically rejecting loans due to rigidly designed criteria that fail to consider individual circumstances.

2.2.2.5. Security Risks: Intelligent systems are vulnerable to cyberattacks. Compromises can cause significant financial losses or the leakage of sensitive data, leading to a loss of trust in the digital system and threatening the sustainability of financial inclusion.

2.2.2.6. Poor transparency and difficulty in understanding decisions: Some artificial intelligence algorithms rely on complex internal processes (such as neural networks), which makes interpreting their decisions difficult for both users and regulatory bodies, thus weakening the possibility of objection or correction.

3. An analytical study of the role of artificial intelligence in promoting financial inclusion in the virtual bank "PayPal", the Indian bank "ICCICI", and the Bahraini bank "ABC"

In this section, we will attempt to evaluate these three banking experiences by reviewing the technical mechanisms, operational models, quantitative results (indicators and statistics), as well as the challenges they faced in expanding financial inclusion by relying on artificial intelligence technologies.

3.1. The American Virtual Bank PayPal Experience

3.1.1. Introducing PayPal: The bank is considered one of the most prominent global models in the field of digital financial services. It originated and developed as a virtual financial institution without a traditional branch-based banking structure, relying entirely on technology to provide its services. The company was founded in 1998 under the name "Confinity," and later merged with X.com, which was founded by Elon Musk. It was renamed PayPal in 2001, then went public in 2002 before being acquired by eBay. It later became an independent company again in 2015 (PayPa Company Historyl, 2025) .

A defining characteristic of PayPal's experience is its early adoption of advanced technology, particularly artificial intelligence, in transaction management, fraud prevention, and user behavior analysis. The company began using machine learning systems in the early 2010s to develop automated transaction monitoring capabilities and identify fraudulent patterns in real time, giving it a significant competitive advantage over traditional banks (Accenture, 2022) .

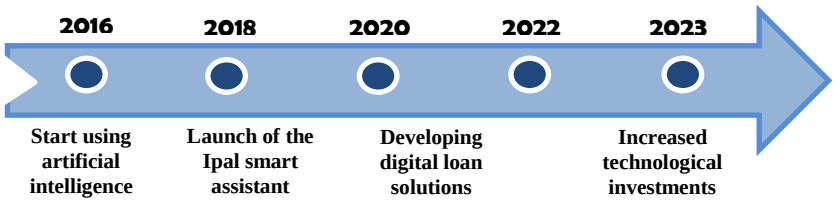
PayPal has also made a notable contribution to promoting digital financial inclusion by enabling unbanked individuals to access flexible and fast financial services, especially in

developing countries or regions lacking financial infrastructure. The company has adopted strategies to facilitate account creation and linking to digital identities, thereby expanding its customer base in rural areas, among women, and among unemployed youth (World Bank Group, 2020) .

3.1.2. The reality of artificial intelligence at PayPal: The financial sector is witnessing a radical transformation due to the integration of artificial intelligence technologies in its various operations. PayPal is no exception to this trend, but rather is considered one of the pioneers in this field. Since its beginnings as a digital virtual bank, PayPal has relied on artificial intelligence as a strategic tool to enhance transaction security, improve user experience, and develop predictive analytics tools. With the significant expansion of its user base around the world, artificial intelligence has become a pivotal element in the operation of the platform, not only to improve efficiency but also to support broader goals related to financial inclusion and innovation in digital financial services.

3.1.2.1. Timeline of AI adoption at PayPal: As one of the leading players in the field of financial technology, PayPal has witnessed a remarkable development in its technological infrastructure over the last decade, as it has gradually moved towards adopting artificial intelligence technologies to support its operational and financial processes. This transformation came in response to the requirements of expansion, enhancing digital security, and improving the user experience. Tracking the stages that the adoption of these technologies has gone through within PayPal is essential to understanding its digital maturity and its connection to the goals of financial inclusion.

Figure (01): Timeline of AI adoption at PayPal



Source: (PayPal Annual Reports, 2016-2023)

The graph illustrates a timeline of the most important milestones that PayPal has gone through in adopting and developing artificial intelligence technologies, steps that reflect a strategic shift in its technological structure:

- **2016** :Introducing Fraud Detection Algorithms: This step formed the cornerstone of PayPal's approach to protecting its users from digital threats. The platform began relying on machine learning models capable of analyzing transaction patterns and detecting unusual activity in real time, which helped significantly reduce fraud rates in the following years.
- **2018** :Adopting Smart Recommendation Algorithms: At this stage, PayPal began investing in artificial intelligence to enhance the user experience by personalizing recommendations and offers based on analyzing user behavior and preferences. This boosted engagement rates and merchant sales on the platform.
- **2020** :Launching Smart Chatbots: With the increasing number of users globally, PayPal deployed smart chatbots to serve customers, reducing waiting times and providing immediate answers to user questions while maintaining high-quality technical support.
- **2022** :Credit Behavior Analysis: This year witnessed a significant shift in the use of artificial intelligence to assess credit risk. This enabled the provision of financial services to new, underserved segments of the population, supporting financial inclusion.

- **2023** :Generative AI: Starting to develop more advanced AI models to analyze data autonomously and generate complex predictive scenarios, which enhances the accuracy of anti-fraud systems, customer classification, and others.

2.2.1.3. Comparison of the stages of investment in artificial intelligence within PayPal: PayPal's investments in artificial intelligence have witnessed gradual and remarkable growth, reaching $150 million in 2016, gradually doubling to reach 750 million $ by 2023. This increase reflects a long-term strategic commitment by the company towards establishing an intelligent infrastructure within its services.

It is noteworthy that after 2022, a qualitative shift was observed in the nature of investments, as PayPal moved towards generative artificial intelligence (GAI), through funding projects to analyze user behavior in real time, develop dynamic recommendation tools, and apply large language models (LLMs) in customer service and automated marketing. This shift reflects PayPal's move from merely employing artificial intelligence in the security infrastructure to making it a fundamental tool for decision-making and user experience.

Table (02): Comparison between the stages of investment in artificial intelligence within PayPal Bank

Element	Traditional Artificial Intelligence 2016-2021	Generative AI 2022-2023
Primary Focus	- Fraud prevention, customer service automation, recommendations	- User behavior analysis, customer segmentation, content creation.
Technical Examples	- Fraud detection algorithms, chatbots, recommendation engines	- Large Language Models (LLMs), predictive generation tools.
Percentage of AI Spending as a Result of Total Investment	- 65% of total AI investments	- 35% growth in 2022-2023, steadily increasing.
Operational Objectives	- Reduce costs and improve security	- Improving user experience and intelligent automated decision-making.
Results	Fraud has decreased significantly, and automated responses have been improved.	Enhancing recommendation accuracy and user engagement

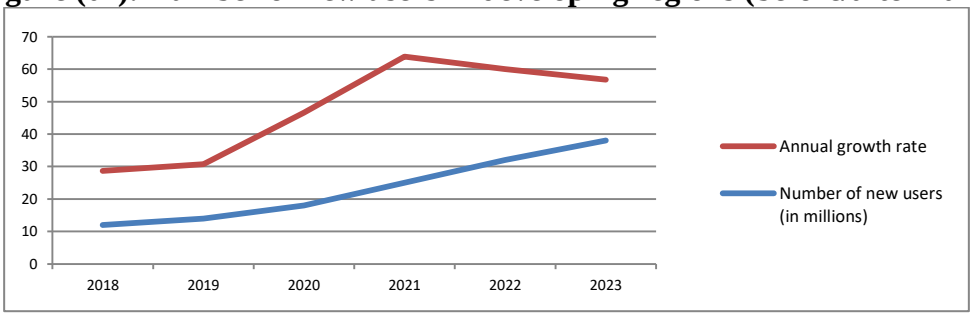
Source: (PayPal Company Profile, 2023)

This table shows that PayPal has moved since 2022 from defensive/operational use of artificial intelligence towards proactive and predictive use aimed at improving user experience and promoting financial inclusion.

3.1.3. The Role of Artificial Intelligence in Enhancing Financial Inclusion at PayPal : In light of the accelerating digital revolution, financial inclusion has become a strategic goal pursued by many financial platforms, most notably PayPal. Artificial intelligence has played a pivotal role in facilitating access to financial services, particularly in developing regions, by simplifying account opening procedures, analyzing data to provide personalized services, and overcoming obstacles related to official documentation. In this context, we will review how artificial intelligence at PayPal has contributed to enhancing financial inclusion and achieving greater integration for unbanked groups.

3.1.3.1. Number of new users in developing regions (before/after 2020): Below we will explain the impact of artificial intelligence on expanding PayPal's user base in developing regions, by comparing the number of new users before and after 2020, the year in which the company began to widely adopt AI technologies.

Figure (02): Number of new users in developing regions (before/after 2020)



Source: (fxborssa.com, 2025)

3.1.3.2. Global Spread of PayPal Use: The following table shows the spread of the bank by region, as well as those not connected to traditional banks:

Table (03): Global Spread of PayPal Use

Number of PayPal users not affiliated with traditional banks				Global PayPal usage by region	
Year	Number of non-(millions)bank users	Percentage of total users		Geographical area	Percentage of users out of the total
2019	08	07 %		North America	35 %
2020	12	09 %		Europe	25 %
2021	18	11 %		Asia Pacific	20 %
2022	25	13 %		Latin America	10 %
2023	30	15 %		Africa	07 %
				Middle East	% 03

Source: (PayPa Company Historyl, 2025)

The table shows that PayPal has a strong presence in developing markets, especially in Latin America and Africa, which reinforces the hypothesis of the role of artificial intelligence in accelerating and expanding this spread. The table also highlights the bank's role in integrating unbanked individuals into the digital financial system, especially after the integration of artificial intelligence tools into verification and registration processes.

3.1.3.3. Facilitating account creation using AI for those with limited official documentation: Based on the data in the table, it is clear that artificial intelligence has played a pivotal role in promoting financial inclusion by facilitating the opening of financial accounts for individuals not traditionally represented in the banking system. AI-supported identity recognition technologies (such as facial recognition and AI-based identity verification) have enabled individuals lacking official documents, such as refugees or those working in the informal sector, to access financial services without having to go through complex traditional procedures.

The annual increase in the number of accounts created in this way, from 4 million in 2020 to 22 million in 2023, demonstrates the effectiveness of these smart solutions in expanding the base of financial inclusion by breaking down bureaucratic barriers and enabling fairer and more inclusive access to digital financial platforms such as PayPal.

Table (04): Facilitating account creation using AI for those with limited official documents

The year	Accounts created in this way (million)	Percentage of total new accounts
2020	04	08 %
2021	10	14 %
2022	16	18 %
2023	22	22 %

Source : (paypal.com, 2025)

3.2. The experience of the Indian bank "ICICI".

India, with its demographic and developmental challenges, is an ideal model for understanding how technology can contribute to integrating marginalized groups into the financial system. In this context, ICICI Bank has emerged as one of the most prominent banks that adopted artificial intelligence solutions early on to expand the scope of its services and achieve financial inclusion through innovative digital tools.

3.2.1. Introduction to ICICI Bank: ICICI, short for Industrial Credit and Investment Corporation of India, is a pillar of India's private banking sector and holds a leading position among commercial banks in terms of asset size, market capitalization, and customer base.

The bank was originally established in 1955 as a Development Finance Institution (DFI) with funding from the World Bank and the Indian government to finance major industrial projects. In 1994, it was transformed into a fully-fledged commercial bank operating across various banking and financial services sectors after merging its financing arm with its formal commercial banking entity (ICICI-Bank, ICICI Bank, Corporate Profile, 2023).

Today, ICICI is the second largest bank in India by assets after the State Bank of India (SBI). It occupies a pivotal position in the digital transformation of financial services, offering a comprehensive suite of banking products including retail, corporate, and investment banking, insurance, asset management, online banking, and more (India Bank, 2023).

Through a massive banking network comprising more than 5,000 branches and 13,000 ATMs distributed throughout India, along with international branches in North America, Europe, Asia and the Middle East, the bank has been able to expand its presence both locally and globally (Singh& Pate, 2022, p. 105) .

The bank's role was not limited to being a provider of traditional financial services, but it became a key player in supporting the Indian government's plans to promote financial inclusion, especially by targeting financially excluded groups from rural and remote areas. This is attributed to its progressive nature and rapid adoption of modern technologies such as artificial intelligence, cloud computing, and Fintech technology, as the bank has become classified among the most innovative banks in South Asia by many international financial institutions (Sharma, 2021, p. 88) .

3.2.2. The reality of artificial intelligence in the Indian ICICI Bank: Technological innovations represent the core of digital transformation in the banking sector, where artificial intelligence has become one of the most prominent tools adopted to enhance operational efficiency and improve customer experience. In this context, the Indian ICICI Bank is among the leading financial institutions that adopted artificial intelligence at early stages, harnessing its capabilities in developing smart banking products and services, which contributes to expanding the scope of financial inclusion and enhancing automated interaction with customers. Hence, the importance of studying the reality of artificial intelligence within this bank emerges to understand its development and practical effects.

3.2.2.1. Timeline of AI Adoption at ICICI Bank India: Artificial intelligence (AI) technologies are a key part of ICICI Bank India's digital transformation. The bank began using AI in recent years to improve banking operations and expand financial inclusion. This included the use of technologies such as the iPal smart assistant, which facilitates customer interaction, and the application of big data analytics to deliver innovative banking solutions. Since the initial implementation of these technologies, the bank has steadily increased its investments in technology.

The timeline reflects the evolution of AI at ICICI Bank through distinct phases, beginning in 2016 when the bank started adopting smart technologies to support core banking transactions. 2018 marked a major turning point with the launch of the iPal smart virtual assistant, which improved customer interaction and reduced pressure on branches.

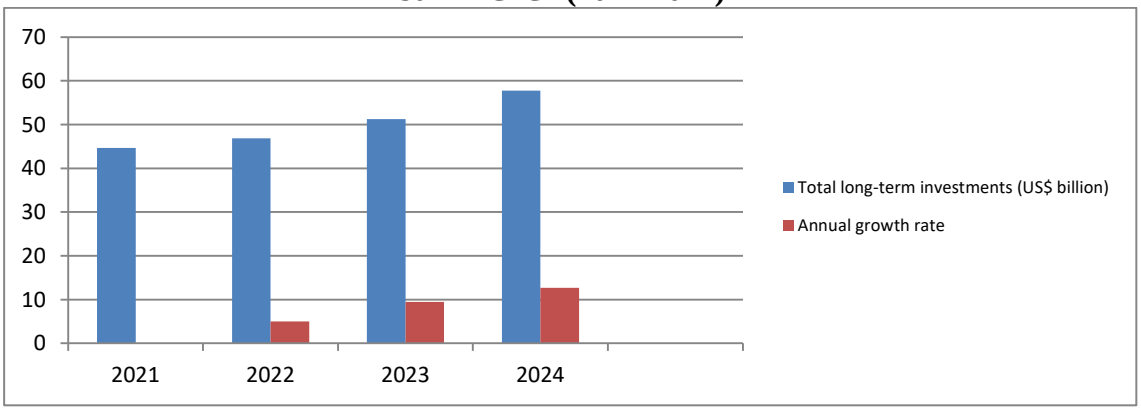
Starting in 2020, the bank expanded its investments to include big data analytics and automated credit services, leading to the provision of instant digital loans and improved lending

decisions. This momentum continued into 2022 as the use of artificial intelligence increased in fraud detection and the personalization of financial products.

The chart shows that adopting artificial intelligence was not a spur-of-the-moment decision but a gradual strategic development reflecting the bank's vision of transforming into a comprehensive digital banking institution that seeks to innovate and expand its services, especially in traditionally underserved areas, thereby promoting financial inclusion

3.2.2.2. The evolution of the size of investments in artificial intelligence at the Indian bank ICICI: ICICI Bank realized early on the importance of global shifts towards artificial intelligence and devoted increasing financial resources to developing its technological infrastructure and expanding the applications of artificial intelligence in its various operations. The following figure highlights the evolution of the bank's long-term investments during recent years, as an indicator of the continuous expansion in supporting digital transformation and artificial intelligence.

Figure (03): The evolution of the size of investments in artificial intelligence at the Indian bank ICICI (2021-2024)

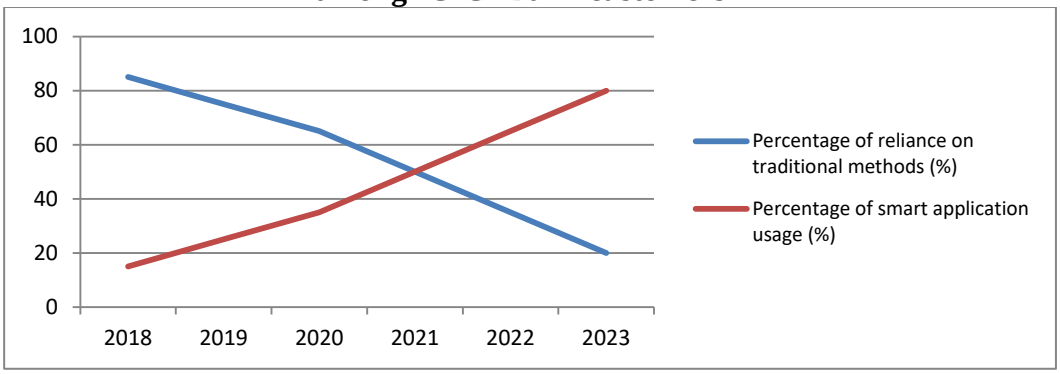


Source : (ICICI Bank, MacroTrends – ICICI Bank Long-Term Investments, 2021–2024)

The figure above shows the continued growth in ICICI Bank's long-term investments over the past four years. This growth reflects the bank's commitment to strengthening its infrastructure and expanding its services, including investments in modern technologies such as artificial intelligence. However, specific details about the size of investments specifically allocated to artificial intelligence are not available within these general figures.

3.2.2.3. The impact of artificial intelligence on banking services: ICICI Bank's adoption of artificial intelligence technologies has led to a qualitative shift in customer experience, through improved service automation, the provision of smart interaction, and the use of big data analytics. These technologies have contributed to raising the efficiency of banking transactions and facilitating access to services through smart applications. The following graph shows the increased use of smart applications compared to the decreased reliance on traditional methods.

Figure (04): The evolution of the use of smart applications versus traditional methods among ICICI Bank customers



Source: (India Bank, 2023)

The figure above reflects a gradual and systematic shift in ICICI Bank customers' behavior towards AI-powered digital channels. In 2018, the vast majority of banking transactions relied on traditional methods, accounting for 85%, while the use of mobile applications did not exceed 15%, indicating an early stage in digital transformation.

However, over the years, thanks to the bank's significant investments in developing advanced digital infrastructure and employing AI technologies (such as the iPal virtual assistant and the iMobile Pay application), digital services have witnessed steady growth, reaching 80% usage in 2023, compared to a decline in traditional methods to only 20%.

3.2.3. The Role of Artificial Intelligence in Enhancing Financial Inclusion at ICICI Bank : Artificial intelligence (AI) has significantly transformed the banking sector in India, helping financial institutions like ICICI Bank adopt innovative solutions to improve access to financial services and enhance financial inclusion. Financial inclusion is a cornerstone of financial stability and national economic development, and AI's role in this area is particularly evident in expanding banking services to underserved individuals and businesses.

3.2.3.1. Providing Digital Microloans: ICICI Bank is leveraging AI to provide microloans to individuals in rural areas and lower-income social classes. AI also assists in analyzing financial data and making accurate credit decisions quickly, thus enhancing the bank's ability to provide financial services to segments previously excluded from traditional banking services.

The table reflects the pivotal role of artificial intelligence (AI) in enhancing the effectiveness and targeting of ICICI Bank's digital microcredit programs. The estimated reach of over 350 million first-time borrowers indicates a qualitative shift in the bank's ability to penetrate segments of society traditionally excluded from credit services, particularly in rural areas and among low-income individuals. Furthermore, the reduction in default rates by up to 33% highlights the effectiveness of AI-powered credit scoring algorithms, which rely on analyzing user behavior and financial and social data with up to 90% accuracy. This not only improves the sustainability of the financial system but also reduces the operational risks that previously limited banks' ability to grant microloans without strong collateral.

Overall, ICICI Bank's adoption of AI in providing digital loans represents not merely a technological shift but a strategic move towards a more inclusive and efficient banking system capable of supporting broad-based economic development, especially among vulnerable groups.

Table (05): Indicators on the use of artificial intelligence in providing digital microloans

Indicator	Details
- Estimating the number of potential new borrowers	Experts estimate that artificial intelligence (AI) will help lenders reach more than 350 .million first-time borrowers
- Reducing default rates	AI is expected to contribute to reducing loan .defaults by at least 33%
- Accurate predictive analytics	Predictive analytics demonstrates up to 90% accuracy in assessing the repayment behavior of potential customers

Source: (ICICI-Bank-blog, 2025)

3.2.3.2. Increased Access for Women and Farmers: By providing innovative digital financial solutions, ICICI Bank has helped empower women and farmers in rural areas to access affordable loans and financing programs. Using artificial intelligence to analyze personal data and financial history, the bank has been able to tailor financial offerings to meet the needs of these groups.

The table above demonstrates ICICI Bank’s commitment to promoting financial inclusion and empowering women in rural and peri-urban areas of India. As of March 31, 2022, the bank had provided loans to over 9 million women through more than 692,000 self-help groups (SHGs), indicating significant success in expanding financial services to traditionally excluded groups.

Of these, 3.8 million women were first-time users of the banking system, highlighting the bank's role in integrating women into the formal financial system.

In addition, approximately 1.3 million women benefited from loans through shared responsibility groups, reflecting the effectiveness of partnerships with local institutions in providing financing to low-income groups. These figures reflect ICICI Bank's success in using crowdfunding models and modern technologies to expand the customer base and promote financial inclusion, especially among women in rural areas. These initiatives demonstrate how financial institutions can use innovative strategies to reach excluded groups, contributing to achieving sustainable economic and social development.

Table (06): Increasing access for women and farmers

Category	Number of beneficiaries	Notes
Women receiving loans through self-help groups (SHGs)	More than 9 million	Loans were provided through more than 692,000 groups as of March 31, 2022.
Women receiving loans through shared responsibility groups (JLGs)	Approximat ely 1.3 million	Loans were provided through partnerships with various institutions.
First-time beneficiaries	3.8 million	They had no prior dealings with other banks.

Source : (ICICI-Bank, Annual Report, 2021-2022)

3.2.3.3.New Users in Developing Areas: The table reflects ICICI Bank's progress in promoting financial inclusion, particularly in remote and rural areas. It shows the opening of over 21.1 million Basic Savings Accounts (BSBDAs), a significant figure that demonstrates the bank's expansion in providing simplified and accessible financial services to groups previously excluded from the traditional banking system. It also indicates that approximately 4.4 million of these accounts were opened under the Jan Dhan Yojana program, a national Indian initiative aimed at promoting basic banking.

These figures highlight the practical impact of using digital tools and artificial intelligence platforms to facilitate account opening without requiring physical presence. This contributes to reducing geographical and administrative barriers that previously prevented large segments of the population from accessing the banking system. Furthermore, they demonstrate that ICICI Bank has not only expanded its geographical reach but has also focused on the financial empowerment of underrepresented groups within the banking system, such as women, farmers, and rural residents.

Therefore, this table does not represent merely quantitative statistics, but rather expresses a qualitative shift in the bank's role from a mere provider of financial services to a social and technological actor that contributes to comprehensive development by employing artificial intelligence to serve major economic and social goals.

Table (07): Number of accounts opened in rural and semi-urban areas (ICICI Bank as of March 31, 2023)

Category	Total number of accounts	Note
Basic Bank Savings Accounts (BSBDA)	More than 21.1 million accounts	Accounts opened in rural and semi-urban areas are included.
Accounts opened under the Pradhan Mantri Jan Dhan Yojana Scheme	Approximately 4.4 million accounts	This is part of basic savings bank accounts.

Source: (ICICI Bank, Enhancing rural and inclusive banking services, 2023)

3.3. The Experience of ABC Bank Bahrain

ABC Bank Bahrain is a prime example of the development of banking institutions in the Arabian Gulf region. The bank has established itself as one of the leading banks in Bahrain and the region thanks to its advanced strategies and diverse services. ABC Bank was founded in 1980, becoming an essential part of the Bahraini and regional banking sector, offering a wide range of services including commercial banking, investment finance, and Islamic banking.

3.3.1.Introduction to ABC Bank Bahrain: The Arab Banking Corporation, known as ABC Bank, was established on January 17, 1980, by Amiri Decree No. 02 of 1980 in the Kingdom of Bahrain with an authorized capital of US$1 billion. The bank commenced operations in April of the same year after obtaining an offshore banking license from the Bahrain Monetary Agency.

Since its establishment, ABC Bank has expanded its operations to more than 17 countries across the Middle East, North Africa, Europe, the Americas, and Asia. The bank offers a wide range of banking services, including trade finance, treasury, structured finance, corporate and institutional banking, Islamic banking, and retail banking through its branches in Algeria, Egypt, Tunisia, and Jordan, and its digital platform "ila" in Bahrain and Jordan (Oanh and al, 2018, p. 11).

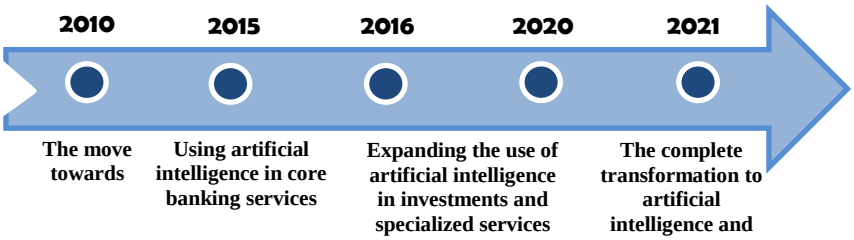
ABC Bank is a Bahraini public shareholding company listed on the Bahrain Bourse since 2006. The Central Bank of Libya is its largest shareholder with a 59.37% stake, followed by the Kuwait Investment Authority with 40.63%.

In its pursuit of technological advancements, ABC Bank launched ila Bank in Bahrain, a fully digital banking platform designed to provide innovative and user-friendly banking services. The bank also established ABC Labs to accelerate its digital transformation and foster a flexible and innovative work culture within the organization.

3.3.2. The Reality of Artificial Intelligence at ABC Bank Bahrain: ABC Bank Bahrain is one of the leading financial institutions in the Middle East that has adopted artificial intelligence as a core part of its digital strategy since 2017. The bank began its digital transformation journey in 2019, leading to the launch of "Fatima," the region's first emotionally intelligent digital assistant. Fatima embodies the new digital bank "Ella," the first fully digital bank in Bahrain, offering an innovative mobile banking experience.

3.3.2.1. The Timeline of AI Adoption at ABC Bank Bahrain: ABC Bank Bahrain is a pioneer in adopting modern technologies, including artificial intelligence (AI), to enhance its banking experience and operational efficiency. Over the years, the bank has gone through several phases in integrating AI into its strategies. The following outlines the evolution of AI adoption at the bank:

Figure (05): Timeline of AI adoption at ABC Bank Bahrain



Source: (Sanvi Avouyi-Dovi and al, 2009, pp. 1-25)

- **The Beginning**, **The Move Towards Digitalization (Prior to 2010)**: In the years prior to 2010, the bank was in the early stages of digitizing its services, beginning to utilize some basic technological solutions to enhance banking services. During this period, innovations in artificial intelligence (AI) were generally limited in the banking sector, but the bank was gradually developing its approach to employing digital technologies to improve customer experiences.

- **Phase One**, **Using AI in Core Banking Services (2010–2015)**: Between 2010 and 2015, ABC Bank began gradually introducing AI technologies into some core banking services. AI applications began to emerge through intelligent chatbots that handled simple customer inquiries, leading to faster response times and reduced waiting times at bank branches.

AI was also used in banking security systems, such as identifying unusual patterns in customer transactions using intelligent data analysis. These systems helped the bank reduce fraud risks and enhance cybersecurity.

- **Phase Two, Expanding the Use of Artificial Intelligence in Advisory and Personalized Services (2016–2020):** From 2016 to 2020, ABC Bank expanded its use of artificial intelligence (AI) to encompass more specialized areas. The bank began implementing advanced technologies such as machine learning (ML) and big data analytics to provide personalized financial advice to its clients, enabling it to offer more accurate and tailored banking solutions to each client's individual needs.

AI was also employed to enhance risk management and make more accurate financing decisions. This expansion contributed to strengthening the bank's efficiency and increasing customer satisfaction by offering innovative services such as predicting future customer needs based on available data.

- **Phase Three, Full AI Transformation and Continuous Improvement (2021–Present):** Since 2021, AI has become a core element of ABC Bank Bahrain's strategy. The bank has taken a significant step towards full digital transformation, with AI becoming part of its core infrastructure. AI systems have been developed to support a wide range of services, including:

- **Smart Technical Support**: Using AI-powered systems to provide immediate technical support and assistance to bank customers.
- **Smart Personal Finance**: Applying AI technologies to analyze customer needs and provide data-driven, personalized financing solutions.
- **Predictive Risk Analysis**: Leveraging AI to anticipate potential risks and analyze economic trends to guide investment decisions.
- **Expanding Digital Banking Services**: Enhancing the user experience through AI-powered digital platforms, such as smartphone applications that utilize voice and image recognition technologies.

3.3.2.2. Evolution of Investments in Artificial Intelligence at ABC Bank Bahrain: The following table shows the evolution of investments in artificial intelligence at ABC Bank Bahrain, based on available information:

Table (08): The development of the size of investments in artificial intelligence at ABC Bank Bahrain.

The year	Key Initiative	Description
2019	Launch of "Fatima"	The region's first smart digital employee, utilizing artificial intelligence and emotional learning to enhance customer experience.
2020	Establishment of "ABC Labs"	An innovation hub focused on developing AI technologies and collaborating with technology companies.
2024	Development of Digital Infrastructure	A $100 million investment to upgrade digital infrastructure, including AI platforms.
2025	Enhancing Artificial Intelligence in Operations	Expanding the use of AI across various banking operations, including advanced analytics and risk management.

Source : (Martin cihák, 2007, p. 49)

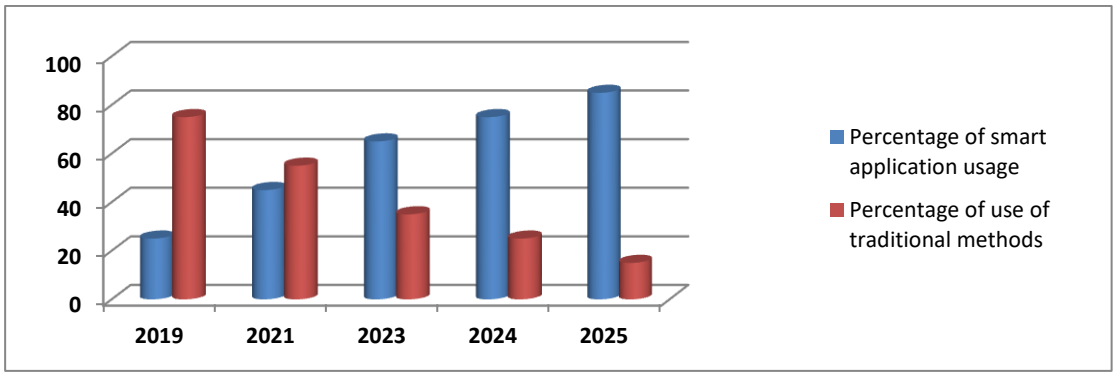
The table above reflects ABC Bank Bahrain's steadily increasing and strategic investment in artificial intelligence (AI) technologies, demonstrating an early awareness of the importance of this technology in banking transformation. The following can be observed:

- **Early Start (2019):** The launch of "Fatima" was a pioneering step in the region, as the bank not only utilized AI technically but also integrated emotional and interactive aspects, enhancing the user experience and demonstrating a move towards "human AI".
- **Institutional Investment (2020):** The establishment of "ABC Labs" reflects the bank's shift from simply using technology to developing it internally, demonstrating advanced digital maturity and a long-term strategy.
- **Significant Financial Investment (2024):** The $100 million investment in digital infrastructure represents a clear financial commitment, a substantial figure reflecting management's confidence in the efficiency and productivity benefits of AI.
- **Focus on Automation and Analytics (2025):** In its final phase, the bank is moving towards widespread adoption of artificial intelligence (AI) in critical operational processes such as risk management and analytics. This highlights the shift of AI from customer service to the very core of banking operations.

The table demonstrates that ABC Bank's investments in AI were not arbitrary or temporary, but rather part of a comprehensive vision that began with customer service, then moved to research and development, culminating in a complete transformation towards smart operations. This dynamic positions the bank among the leading digital banks in the Gulf region and perhaps in the Arab world as a whole.

3.3.2.3. Evolution of Smart App vs. Traditional Methods Usage Among ABC Bank Bahrain Customers: The bank has witnessed a significant shift in customer behavior, with increased reliance on smart apps compared to traditional banking methods. This change is attributed to the bank's innovative digital strategies, such as the launch of ila Bank in 2019, a fully digital bank operating via smartphone applications.

Figure (06): A comparison between the use of smart applications and traditional methods at ABC Bank Bahrain.



Source: (chattha, 2015, p. 65)

The figure reflects a gradual and accelerating shift in the behavior of ABC Bank Bahrain customers, as the vast majority have moved from using traditional methods to increasingly relying on smart applications in their banking transactions. The percentage started low in 2019, when it did not exceed 25%, but with the bank launching advanced digital services, most notably Ella Bank, and its keenness to improve the user experience through easy and interactive interfaces, the percentage rose to 65% by 2023. In recent years, especially after 2024, reliance on smart applications has become the norm at a rate of 85%, which indicates the success of the bank's strategy in digital transformation and gaining customer trust. This development does not only reflect a technological leap, but also expresses a cultural change among customers who have come to prefer speed, flexibility, and immediate access to financial services without the need to visit traditional branches.

3.3.3. The Role of Artificial Intelligence in Enhancing Financial Inclusion at ABC Bank Bahrain: ABC Bank Bahrain has undergone a remarkable strategic transformation in its digital infrastructure by adopting artificial intelligence (AI) solutions to provide more inclusive and flexible banking services. In this context, AI is no longer merely a technological option but has

become an integral part of the bank's strategy to enhance financial access and expand its customer base, particularly among youth, women, expatriates, and residents in underserved areas. This transformation can be highlighted by analyzing how AI-powered digital innovations have contributed to advancing financial inclusion within the bank, through quantitative indicators and concrete application models.

3.3.3.1. ABC Bank Bahrain Financial Inclusion Indicators: The table of financial inclusion indicators at ABC Bank Bahrain reflects a remarkable development in the bank's digital performance and the extent to which artificial intelligence contributes to facilitating access to financial services. According to Table 12 below, the number of new accounts opened via smart applications increased from 10,000 in 2019 to 120,000 in 2024, which represents growth exceeding 1000% in just five years. This rapid growth indicates the success of the bank's digital transformation and the increasing confidence of customers in using smart means instead of traditional methods.

able (09): Financial Inclusion Indicators at ABC Bank Bahrain

Year	Number of new accounts via the app:	Percentage of new customers under 30 years old:	Number of micro-digital loans
2019	10,000	18%	2,000
2021	35,000	27%	8,500
2024	120,000	41%	25,000

Source: (Glenn Hoggarth and al, 2025, p. 392)

The financial inclusion indicators table at ABC Bank Bahrain reflects a remarkable development in the bank's digital performance and the extent to which artificial intelligence contributes to facilitating access to financial services. The number of new accounts opened via smart applications increased from 10,000 in 2019 to 120,000 in 2024, which represents growth of more than 1000% in just five years. This rapid growth indicates the success of the bank's digital transformation and the increasing confidence of customers in using smart means instead of traditional methods.

The percentage of new customers under the age of 30 also increased from 18% to 41%, indicating that the bank has become more attractive to younger demographics, who often prefer flexible and fast digital solutions. Similarly, micro-digital loans saw a significant surge from 2,000 to 25,000, demonstrating that artificial intelligence has enabled the bank to expand its customer base, particularly those without a traditional credit history.

These indicators highlight how the application of artificial intelligence has not only been a technological improvement but also an effective strategic tool for promoting financial inclusion by attracting new segments and providing them with tailored and efficient services.

2.3.3.3. Artificial intelligence as a tool to reach the unbanked: The table below illustrates how ABC Bank Bahrain has leveraged artificial intelligence (AI) to overcome traditional barriers preventing large segments of society from accessing the banking system. Low-income workers, previously hindered by collateral requirements and complex procedures, can now open accounts and obtain microloans thanks to behavioral analysis-based risk assessment systems that replace traditional credit records. This transformation represents a significant shift in understanding risk and providing financing to marginalized groups.

Young people, often lacking guidance and banking experience, have benefited from intelligent consultations offered by chatbots. This has helped enhance their financial literacy and empower them to make informed financial decisions, such as saving or seeking financing. Furthermore, AI has enabled non-working women to interact with banking services securely and privately, helping to break down traditional social barriers that previously prevented their financial inclusion.

This table clearly demonstrates that AI is not merely a technological tool but an effective means of social and economic empowerment, precisely targeted at marginalized or traditionally

unbanked groups, within a strategic vision for financial inclusion based on intelligence and flexibility.

Table (10): Artificial intelligence as a tool to reach non-bank customers

Target Audience	Previous challenges	The Role of Artificial Intelligence	The result:
Low-income workers	Lack of collateral	Behavioral Risk Assessment	Opening accounts + loans
Youth	Lack of banking experience	Robot Consulting	Financial literacy + savings
Unemployed women	Social constraints	Secure and Fast Communication	Gradual banking integration

Source: (Glenn Hoggarth and al, 2025, p. 392)

Conclusion

In conclusion, and in light of the preceding theoretical and applied analysis of artificial intelligence (AI) and its relationship to expanding financial inclusion, particularly within the three banks studied, it can be said that technological advancements have become a cornerstone in reshaping the global financial system. Specifically, they have enhanced the ability of banking institutions to reach segments of the population traditionally excluded from banking services. Thanks to its capabilities in big data processing, machine learning, and automated decision-making, AI has provided unprecedented opportunities to understand customer behavior and tailor financial products to their needs, thus serving the goals of financial inclusion and economic justice.

This study, through analytical models and the experiences of the three banks studied—PayPal, ICICI Bank, and ABC Bank Bahrain—highlights how the intelligent application of AI extends beyond improving banking performance to encompass broader developmental objectives, such as empowering women, increasing financial inclusion in rural areas, and reducing the gap between the rich and poor in access to financial resources.

- **Study Results:** The following are the most important findings of the study*:*

- Artificial intelligence (AI) directly contributes to improving financial inclusion indicators by analyzing financial behavior, expanding digital services, and providing financial products tailored to low-income groups.
- Comparative studies of the banks included in the study revealed a significant disparity in the degree of investment in AI. PayPal appeared to be the most advanced in deploying algorithm-enabled financial services, while ABC Bank Bahrain witnessed successful phased development despite the limited digital environment in the region.
- The use of AI contributed to reducing the costs of banking operations, enabling financial institutions to expand their services to include previously excluded segments of the population.
- Intelligent algorithms helped in the early detection of credit risks, improving the quality of loan decisions for customers with unclear financial histories.
- Partnerships between banks and fintech companies proved effective in developing innovative digital solutions suitable for those excluded from banking. The study showed, based on the studied experiments, that artificial intelligence can play a pivotal role in reducing the financial gap between the sexes by targeting women with digital financial services that are appropriate to their social and economic needs.

- **Hypothesis Testing**: After the analytical study of the topic and the results obtained, the study hypotheses can be tested as follows*:*

- **The First Hypothesis:** "The use of artificial intelligence contributes to expanding the scope of financial inclusion through the development of low-cost smart financial solutions." This hypothesis was confirmed, as the study demonstrated that the expansion of financial

inclusion and the provision of low-cost smart financial solutions were due to the introduction of artificial intelligence applications.

- **The Second Hypothesis:** "Artificial intelligence enhanced financial inclusion in the banking institutions under study." This hypothesis was also confirmed by the results obtained, as the analysis of the data and information related to highlighting the role of artificial intelligence in enhancing financial inclusion showed this role, albeit partially, as the three banks achieved positive indicators in this regard.

• **Suggestions and Recommendations:** After presenting the study, its findings, and the testing of its hypotheses, the following recommendations can be made:

- Banks should increase their investments in artificial intelligence (AI) technologies specifically designed to serve the financially excluded;
- The use of alternative data for creditworthiness analysis should be expanded, moving beyond exclusive reliance on traditional bank records;
- Partnerships between banks and fintech companies should be supported to develop flexible and inclusive digital solutions;
- Training programs should be established within banking institutions to enhance staff proficiency in using AI tools;
- Transparency and fairness in financial decision-making algorithms should be ensured, and hidden biases in data processing should be avoided;
- Government support should be directed towards developing digital infrastructure in underserved areas to improve access to financial services;
- A gradual and integrated approach to digitizing financial services should be adopted, taking into account the economic and social disparities among different groups;
- Specialized monitoring units should be established within the banks under study to monitor and evaluate the impact of AI on achieving financial inclusion.

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