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Leveraging information technology to enhance financial inclusion in rural Algeria: A case study of the agricultural and rural development bank (BADR) in Jijel

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***Abstract*---**This study aims to explore how information technology (IT) can be leveraged to enhance financial inclusion in rural areas, with a focus on the Agricultural and Rural Development Bank (BADR) in Jijel, Algeria. The research employs a mixed-methods approach, combining quantitative analysis through surveys and qualitative insights via semi-structured interviews with BADR employees and customers. The main tools for data analysis include statistical software for regression analysis and thematic analysis for qualitative data. The findings reveal a significant positive impact of IT on financial inclusion, demonstrating that IT enhances access to, utilisation of, and the quality of financial services in rural regions. Despite challenges related to outdated infrastructure and resistance to change, the study concludes that further investment in IT infrastructure and staff training is essential to fully realise the potential of IT in promoting financial inclusion in rural Algeria.

***Keywords*---**Financial Inclusion, Information Technology, Rural Banking, Algeria, BADR (Agricultural and Rural Development Bank).

1. Introduction

In recent decades, financial inclusion has emerged as a critical topic in discussions on economic and social development, particularly in developing countries. Financial inclusion refers to the process of ensuring access to appropriate financial services for individuals and businesses, with a particular focus on underserved and marginalised communities. This includes the provision of basic financial services such as bank accounts, loans, insurance, and payment

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systems in ways that are affordable, timely, and suitable for the needs of the population.

Financial inclusion plays a pivotal role in driving economic growth, as it enables individuals and businesses to invest in opportunities and stimulate economic activity. Research has demonstrated that financial inclusion significantly contributes to economic development by enhancing the capacity of individuals to save, invest, and manage risks (Mostafa, Ashraf, & Marwa, 2023). Moreover, it serves as a powerful tool for poverty reduction, allowing the poor to smooth consumption, manage risks, and invest in critical areas such as health, education, and small enterprises, thereby reducing poverty and income inequality (Omar & Inaba, 2020). Access to financial services is closely linked to social and economic inclusion, empowering individuals to participate more fully in the economy and addressing issues of inequality, particularly in regions where access to these services is limited (Kuada, 2019).

Despite its clear benefits, financial inclusion faces significant challenges in developing countries. These challenges include inadequate financial infrastructure, particularly in rural areas, low levels of financial literacy, and regulatory barriers that can hinder the expansion of financial services to underserved populations (Tulu, 2023). Moreover, in many developing countries, a large portion of the population relies on informal financial services, which are often unreliable and costly. By promoting financial inclusion, governments can reduce the size of the informal economy, enhance the efficiency of financial transactions, and improve financial stability (Didenko et al., 2022).

Information technology (IT) has increasingly been identified as a powerful tool in overcoming barriers to financial inclusion, offering innovative solutions to extend financial services to previously unbanked populations. This study focuses on the Agriculture and Rural Development Bank (BADR) in Jijel, Algeria, exploring how IT can be leveraged to enhance financial inclusion in rural areas. The selection of BADR as a case study is particularly relevant given its strategic role in providing financial services to rural communities, which are often marginalized in terms of financial access. Understanding the impact of IT on BADR's operations offers valuable insights into broader strategies that can be applied to similar contexts in developing countries, where rural financial inclusion remains a significant challenge.

The Gap in Financial Inclusion within Rural Communities: Rural Algeria, particularly the region of Jijel, faces a significant gap in financial inclusion. The lack of accessible and affordable financial services in these areas has led to a situation where a large portion of the population remains excluded from the formal financial system. This exclusion has far-reaching implications, including limited opportunities for savings, investment, and access to credit, which are essential for economic development and poverty reduction (Kuada, 2019).

Challenges Faced by BADR: The Agriculture and Rural Development Bank (BADR) in Jijel is confronted with numerous challenges in its efforts to extend financial services to rural populations. These challenges include the geographic isolation of many communities, the high cost of providing banking services in sparsely

populated areas, and the low level of financial literacy among rural residents. Additionally, there is a need for more robust IT infrastructure to support the delivery of digital financial services, which could play a crucial role in overcoming these challenges (Mostafa, Ashraf, & Marwa, 2023).

The purpose of this study is to investigate how information technology can be leveraged to enhance financial inclusion in rural areas, specifically through the operations of the Agriculture and Rural Development Bank (BADR) in Jijel, Algeria. By exploring the role of IT in expanding access to financial services, this study aims to provide practical insights into how BADR can overcome the challenges it faces and improve financial inclusion in rural Algeria (Tulu, 2023).
Research Questions:

1) How does information technology contribute to expanding financial services in rural areas of Jijel?
2) What are the specific IT solutions that BADR could implement to improve financial inclusion?
3) What are the barriers to the adoption of IT in promoting financial inclusion in rural Algeria?
4) How has BADR's use of IT impacted financial inclusion in Jijel so far?

2. Literature Review

Financial inclusion refers to the process of ensuring that individuals and businesses have access to useful and affordable financial products and services that meet their needs—transactions, payments, savings, credit, and insurance—delivered in a responsible and sustainable way (World Bank, 2018). It is a critical component of economic development, particularly in developing countries, where large segments of the population often remain excluded from formal financial systems. The importance of financial inclusion lies in its ability to empower individuals, reduce poverty, and promote economic growth by providing access to essential financial services. However, achieving financial inclusion is fraught with challenges, particularly in rural areas. These challenges include limited access to banking infrastructure, low levels of financial literacy, high transaction costs, and socio-cultural barriers that prevent the effective utilization of financial services (Allen et al., 2016). In many developing countries, these barriers are exacerbated by the geographical isolation of rural communities, making it difficult for traditional financial institutions to reach these populations.

Information Technology (IT) has emerged as a transformative force in advancing financial inclusion globally. Theories and perspectives on the role of IT in financial inclusion emphasize its potential to overcome traditional barriers by leveraging digital platforms to deliver financial services more efficiently and at lower costs. Mobile banking, digital payments, and online banking platforms have been particularly effective in expanding financial access to underserved populations, including those in remote and rural areas. Globally, countries like Kenya and India have demonstrated the significant impact of IT on financial inclusion. In Kenya, the introduction of mobile money services such as M-Pesa revolutionized financial access, providing millions of previously unbanked individuals with a means to save, transfer money, and access credit (Suri & Jack, 2016). Similarly, India’s Aadhaar program, which linked biometric identification with financial

services, has been instrumental in bringing financial services to the country's rural population (Sharma, 2016). These global examples illustrate how IT can be harnessed to address the specific challenges of financial inclusion and suggest that similar approaches could be adapted in other contexts, including Algeria.

Comparative analysis with other countries or institutions highlights diverse approaches to leveraging IT for financial inclusion. For instance, Bangladesh's bKash has been a pioneer in mobile financial services, offering a wide range of services to the unbanked population, particularly in rural areas. The success of bKash is largely attributed to its user-friendly mobile platform and the extensive agent network that bridges the gap between formal financial institutions and rural communities (Islam & Liang, 2020). Similarly, in Nigeria, the introduction of mobile banking through platforms like Paga has significantly enhanced financial access in both urban and rural areas, addressing the challenges of financial exclusion in a country with a large unbanked population (Demirgüç-Kunt et al., 2018). These case studies provide valuable insights into how IT can be utilized to promote financial inclusion in Algeria, particularly through the Agriculture and Rural Development Bank (BADR) in Jijel. By analyzing the successes and challenges faced by these countries, the study can identify best practices and potential pitfalls in applying IT solutions to the Algerian context.

3. Methodology

- **Research Design:** This study will employ a **mixed-methods** approach, combining both **quantitative** and **qualitative** research methods to provide a comprehensive understanding of the research problem. The quantitative aspect will allow for the measurement and analysis of numerical data, offering statistical insight into the phenomena under study. In contrast, the qualitative aspect will provide depth and context to the findings, enabling a more nuanced understanding of the participants' perspectives and experiences.

- **Data Collection:** Data will be collected using two primary methods:

  - **Surveys** will be distributed to a representative sample of BADR employees and customers. The survey will consist of both closed-ended and open-ended questions to gather quantitative data on the respondents' experiences and perceptions regarding the bank's services, as well as qualitative insights into their satisfaction and expectations.
  - **Semi-structured interviews** will be conducted with a select group of employees and customers to explore their experiences in greater depth. These interviews will allow for the collection of rich, detailed data that can provide context to the survey findings, highlighting the complexities and nuances that may not be captured through quantitative measures alone.

- **Data Analysis:** The data analysis will be conducted using a combination of statistical software and thematic analysis.
  - **Quantitative data** from the surveys will be analysed using statistical software such as SPSS or R. Descriptive statistics will be used to summarise the data, including measures of central tendency and variability. Inferential

statistics, such as correlation analysis and regression, may also be employed to explore relationships between variables and test hypotheses.

- **Qualitative data** from the interviews will be analysed using thematic analysis. This involves coding the data to identify recurring themes, patterns, and categories. The analysis will aim to interpret the underlying meanings and implications of the participants' responses, providing a deeper understanding of their experiences and perspectives.

1.3 Overview of the Agricultural and Rural Development Bank

- **The Establishment and Development of the Agricultural and Rural Development Bank (BADR)**

The Agricultural and Rural Development Bank (BADR) is one of Algeria's largest commercial banks, established on March 13, 1982. Initially formed from 140 branches transferred from the National Bank of Algeria (BNA), BADR now operates with 300 local branches and 39 regional directorates across the country, making it the largest banking network in Algeria. BADR's primary mission is to promote the development of the agricultural sector and rural areas. It has gained national recognition, ranking first among Algerian banks according to a banking dictionary magazine and 688th globally out of 4100 banks.

BADR's evolution can be divided into several distinct phases:

- **Phase One (1982-1990):** BADR focused on establishing itself in rural areas by opening numerous branches in agricultural regions. Over time, the bank developed a global reputation for financing the agricultural sector, food industries, and agricultural mechanical industries.
- **Phase Two (1990-1999):** Following the enactment of Law 10-90, which ended the specialization of public banks, BADR expanded its activities to include other economic sectors, particularly small and medium enterprises (PME/PMI). Notable achievements during this period include the implementation of the SWIFT system in 1991 and the introduction of automated banking operations in 1993.
- **Phase Three (2000-2002):** This phase marked BADR's active involvement in stimulating productive investments, particularly in small and medium-sized enterprises (PME/PMI). Significant achievements include streamlining administrative procedures related to loan files and extending the bank's accounting system.
- **Phase Four (2003-2008):** During this period, BADR launched personalized banking services across its main branches nationwide.
- **Phase Five (2009-2012):** BADR transitioned from a traditional banking model to a commercial agency organization (OCA), which involves segmenting customers based on shared characteristics to enhance service quality.
- **Phase Six (2013-2019):** BADR introduced several innovations, including the E-BANKING service in 2013, the CNIS electronic system for international trade in 2015, and the FLEXCUBE information system in 2017. Additionally, the bank launched MasterCard services in June 2019, offering customers international transaction capabilities.
- **Phase Seven (2020-2023):** BADR continued to modernize its services by enforcing electronic payment methods in line with Algeria's economic

digitization efforts. The bank introduced the BADR SMS service in March 2021, providing customers with instant notifications for any transactions made on their accounts. In April 2021, the bank also introduced a business card for high-value transactions.

- **The Regional Operating Complex (GRE) - Jijel 018**

The Regional Operating Complex (GRE) is a directorate affiliated with the Agricultural and Rural Development Bank (BADR) and is distributed across the national territory (41 complexes). Post-2005, these complexes became specialized in financing agricultural activities. GREs are responsible for organizing, supporting, monitoring, and supervising the banking agencies under their jurisdiction, which are often located within the same province.
The main functions of the GRE include:

- Acting as an intermediary between BADR's general directorate in Algiers and local operating branches.
- Providing practical and logistical support to the agencies it oversees.
- Coordinating activities among different branches.
- Ensuring compliance with banking regulations and instructions within its affiliated agencies.

As a public economic institution, BADR is tasked with:

- Facilitating customer interactions by opening current accounts.
- Handling deposit and withdrawal operations, as well as financial credits, exchange operations, and treasury management related to its activities.
- Accepting various types of financial deposits, with or without interest.
- Reinvesting deposit amounts into agricultural or commercial loans for both public and private sectors, using either national or foreign currency.
- Subscribing to public securities issued or guaranteed by the state.

Key objectives set by the bank's management include:

- Diversifying and expanding the bank's intervention areas as a comprehensive banking institution.
- Improving customer relations.
- Enhancing service quality.
- Capturing a larger market share.
- Maximizing profitability through effective banking operations.

The organizational structure of the GRE is designed to support its functions and objectives, ensuring efficient management and service delivery within the bank's operations.

2.3 Financial Inclusion at the Agricultural and Rural Development Bank (BADR)

The significance of financial inclusion at BADR was assessed through an empirical study involving a series of questions. The data was analysed using statistical time series from December 2020 to December 2023 to gauge the bank's progress in promoting financial inclusion. The key findings are summarised below.

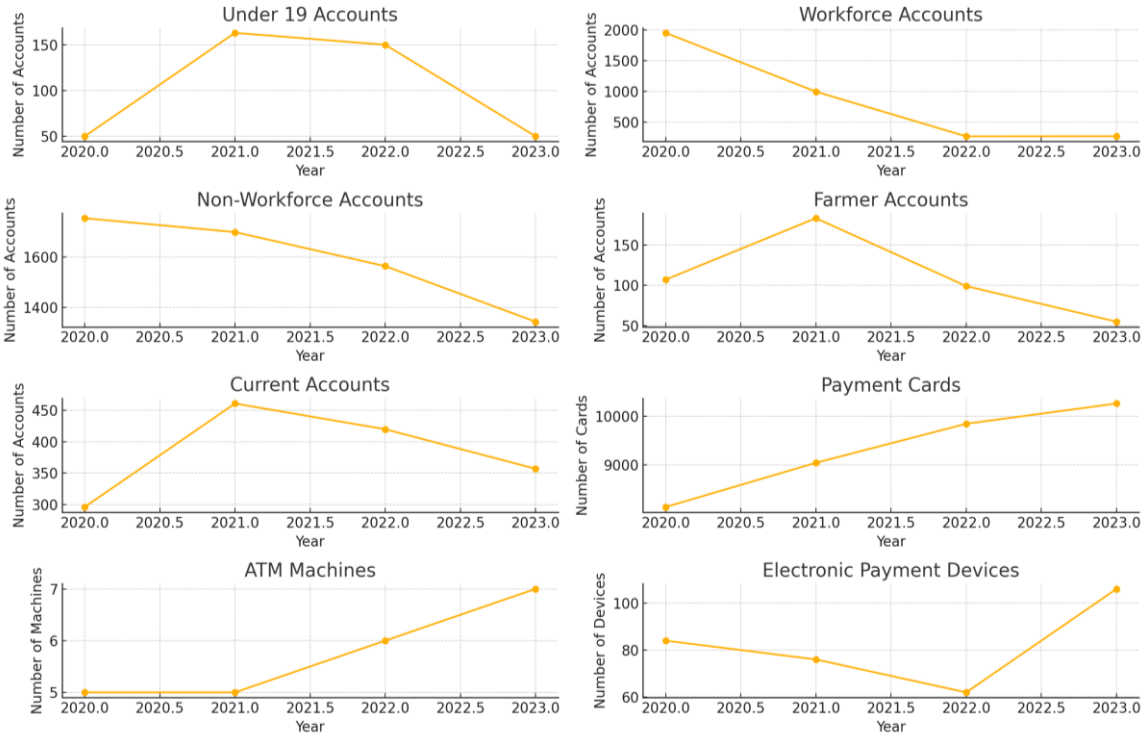

Figure 01: Financial Inclusion Statistics for BADR (2020-2023)
Source: Prepared by the author based on internal data from the Agricultural and Rural Development Bank (BADR)

Here is the summary of the financial inclusion statistics for the Agricultural and Rural Development Bank (BADR) based on the data provided:

The number of accounts held by individuals under 19 years of age fluctuated significantly from 2020 to 2023. In 2020 and 2023, the number of accounts was moderate at 50 each year. However, there was a noticeable peak in 2021 with 163 accounts, followed by a slight decrease to 150 in 2022. This fluctuation may be attributed to varying levels of financial education and ease of account opening processes during these years.

The number of workforce accounts saw a sharp decline from 1951 in 2020 to 994 in 2021. This trend continued with a significant drop to 268 in 2022 and remained relatively stable with 266 accounts in 2023. The initial high number in 2020 could indicate a high demand for opening accounts during that period, which tapered off in subsequent years.

Non-workforce accounts followed a downward trend over the years, starting from 1753 accounts in 2020 and gradually decreasing to 1343 accounts by 2023. This decline suggests a consistent decrease in the demand for account openings among non-workforce individuals. Farmer accounts showed variability, with an initial count of 107 accounts in 2020. The number of accounts peaked in 2021 at 183, followed by a sharp decrease to 99 in 2022 and further down to 55 in 2023.

The peak in 2021 could be due to increased financial activities or targeted programs for farmers during that year.

The number of current accounts saw a steady increase from 296 in 2020 to 461 in 2021. However, this was followed by a decrease to 420 in 2022 and 357 in 2023. The initial rise could indicate a growing trust in the bank's services, while the subsequent decline may reflect changing customer needs or external economic factors.

Payment Cards showed a steady increase each year, indicating growing adoption of digital payment methods among BADR customers. ATM Machines gradually increased in number, reflecting the bank's efforts to expand its ATM network, likely to improve customer accessibility to banking services. Electronic Payment Devices (TPE) experienced a dip in 2021 and 2022 but saw a recovery in 2023, suggesting efforts to modernize payment infrastructure within the bank.

3.3 Technological Devices Available in the Institution:

- **Administration Devices:**
  - Telephones: Facilitate communication between the bank’s agencies, regional centers, and general directorates nationwide.
  - Internal Phone Distribution: Each employee has a desk phone for internal communication, reducing the need for physical movement within the office.
  - Scanners: Two scanners are used for document digitization; one for customer signatures and the other for foreign trade documents.
  - Cheque Scanners, Modems, Computers (HP), Printers, Fax Machines, and Surveillance Cameras are also integral to daily operations.
- **Agency Devices:**
  - Barcode Scanners
  - Banknote Counters: These devices, four in total, count and verify currency quickly, aiding in cash transactions.
  - Advertising Screens: Located at the entrance of agencies, these screens provide visual and audio advertisements for bank services.
- **Networks Used in the Institution:**
  - Intranet: Connects various bank branches and regional centers, ensuring fast and accurate service delivery.
  - Extranet: Links BADR Bank branches with other banks and the Payment Instruments Directorate (DMP).
  - Internet: Offers online services such as e-banking and pre-domiciliation, allowing customers to access their accounts and services online.
- **Banking Software: BADR IMTIYAZ and Flexcube:** These programs are the primary tools for executing and developing banking software, covering all banking operations. They help manage customer data, accounting information, and various banking transactions, and are essential in ensuring customer satisfaction by reducing processing time and eliminating time and space constraints. Unlike many banks, BADR uses both programs to ensure continuous service availability.
- **BADR Bank Website:** Launched in 2002, the website provides comprehensive information about the bank and its services. It allows

customers to submit inquiries, suggestions, and complaints, and also features a news section with the latest updates and events related to the bank.

- **Electronic Payment Methods:**
  - ATMs: These allow customers to withdraw money at any time without needing to visit a teller, reducing pressure on agency staff and providing convenience to customers.
  - Magnetic Stripe Cards:
    - ✓ International Banking Cards (MasterCard): Available in Classic and Titanium versions, allowing for international transactions and withdrawals.
    - ✓ Interbank Payment Cards (CIB): Facilitate cashless transactions, enabling safe and fast payments and withdrawals.
    - ✓ Business Cards: These magnetic cards enable customers to make large purchases and payments.
  - Electronic Payment Terminals (TPE): Small electronic devices connected to the bank's central computer, which verify transactions and deduct the amount from the customer's account, ensuring secure and efficient payment processing.

4.3 Population and Sample of the Study

The population of the study covers all employees of the Agricultural and Rural Development Bank (BADR) in Jijel. The sample members were selected from various branches within the region.

Table 01: Sample of the Study and Administered Questionnaires

Questionnaire	Number	Rate
Number of the administered questionnaires	105	%100
Number of the excluded questionnaires	5	%4.76
Number of the valid questionnaires	100	%95.24

Source: Compiled by the author based on administered questionnaires.

Consistency of the Questionnaire

The consistency of the questionnaire was tested using Cronbach's Alpha, a measure of internal consistency that shows how closely related a set of items are as a group. The results for each dimension of the questionnaire, as well as the overall consistency, are as follows:

Table 02: Cronbach's Alpha Values for the Questionnaire

Variable	Items	Number of Items	Cronbach's Alpha
Information Technology	1-13	13	0.850
Financial Inclusion	14-30	17	
- Access to Financial Services	14-18	5	0.930
- Use of Financial Services	19-23	5	0.853
- Quality of Financial Services	24-30	7	0.930
Overall Questionnaire		30	**0.853**

Source: by the author based on the outputs of SPSS

The Cronbach's Alpha for the entire questionnaire was 0.853, indicating a high level of internal consistency. This suggests that 85% of the respondents' answers would be consistent if the questionnaire were administered again under similar conditions.

Additionally, the Alpha values for each dimension of the questionnaire ranged from 0.850 to 0.930, showing that the questionnaire items within each section are highly correlated, further reinforcing the reliability of the tool.
Internal Consistency Validity: Internal consistency validity was tested using correlation coefficients for each item relative to the mean of all items.

Table 3: Internal Consistency Validity for the First Dimension

Statement	Correlation Coefficient	Significance Level
The bank has advanced information technology equipment.	0.448**	0.000
The bank employs information technology systems in its services.	0.395**	0.000
The bank has a sufficient number of ATMs.	0.463**	0.000

Source: by the author based on the outputs of SPSS

Table 4 presents the internal consistency validity for the first dimension of the questionnaire. Internal consistency is assessed through correlation coefficients for each item relative to the mean of all items in this dimension.

- Statement: The bank has advanced information technology equipment: The correlation coefficient of 0.448 indicates a moderate positive correlation with the dimension's mean, with a significance level of 0.000 confirming statistical significance. This suggests that the item contributes effectively to the dimension's measurement.
- Statement: The bank employs information technology systems in its services: A correlation coefficient of 0.395 reflects a good positive correlation with the dimension's mean, and the significance level of 0.000 confirms its statistical significance. This item is a relevant measure of the dimension.
- Statement: The bank has a sufficient number of ATMs: The coefficient of 0.463 indicates a strong positive correlation with the mean of the dimension, and the significance level of 0.000 verifies its statistical

significance. This suggests that the item is a reliable measure of the dimension.

5.3 Demographic and Occupational Characteristics of the Study Sample

To examine the distribution of the study sample according to demographic variables and to calculate the frequency distributions, see the following tables (refer to Appendix 25).

Table 4: Distribution of Sample by Gender

Gender	Frequency	Percentage (%)
Male	49	49.0
Female	51	51.0
Total	100	100

Source: Prepared by the author based on SPSS outputs.

The table shows that the sample is distributed by gender with 49% males and 51% females.

Table 5: Distribution of Sample by Age

Age Range	Frequency	Percentage (%)
20 to 30 years	13	13.0
30 to 40 years	42	42.0
Over 40 years	45	45.0
Total	100	100

Source: Prepared by the author based on SPSS outputs.

The table indicates that the sample is distributed by age with 13% in the 20 to 30 years category, 42% in the 30 to 40 years category, and 45% over 40 years.

Table 06: The distribution of the informants according to the scientific degree

Scientific Degree	Frequency	Percentage (%)
Secondary Education	5	5.0%
University Education	53	53.0%
Postgraduate Studies	22	22.0%
Other Studies	20	20.0%
Total	**100**	**100.0%**

Source: Compiled by the author based on the data collected from the bank employees.

Table 06 shows that the majority of the informants, 53%, have attained university education, reflecting a significant proportion of employees with higher education. Additionally, 22% of the respondents hold postgraduate degrees, indicating a strong academic presence among the bank's employees. Meanwhile, 20% have other studies, and only 5% have secondary education as their highest level of education. This distribution suggests that the bank employs a well-educated

workforce, which is likely to have a positive impact on the implementation of technological advancements and financial inclusion strategies.

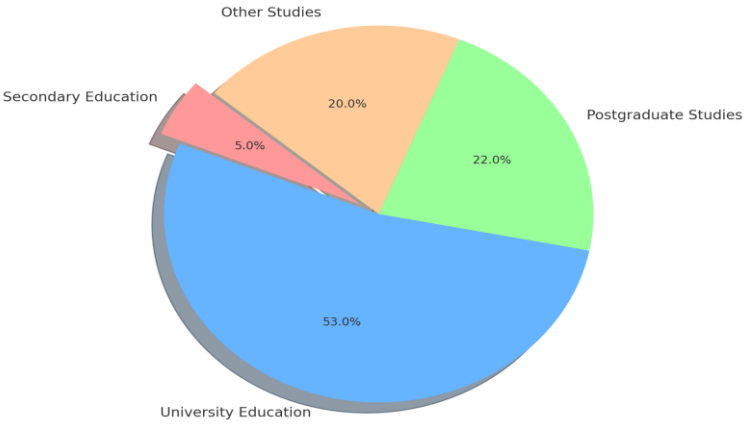

Figure 02: The Graphic Representation of the Informants' Distribution According to the Scientific Degrees

Source: Prepared by the author based on the outputs of SPSS.

6.3 Analysis and Interpretation of the Study Sample's Responses

Table 7: Analysis of Responses Regarding Information Technology

Statement	Standard Deviation	Mean	Rank	Degree
The bank has advanced information technology equipment (modern IT devices).	0.77303	3.7800	04	High
The bank employs information technology systems in its services.	0.63564	3.8000	02	High
The bank has a sufficient number of ATMs.	0.77850	3.8000	03	High
The bank uses email to communicate with its customers.	0.96038	3.3700	12	Moderate
The bank provides necessary information about its services through social media.	0.82749	3.6100	07	High
The bank keeps up with the latest developments in information technology.	0.84537	3.5500	10	High
The bank ensures data availability at any time.	0.79462	3.4300	11	High
The bank selects employees with diverse expertise and advanced skills in handling this technology.	0.86667	3.5800	09	High
The bank negotiates and consults with employees before acquiring technology.	1.02612	3.2400	13	Moderate
The bank allocates a budget for the	0.66750	3.8300	01	High

Statement	Standard Deviation	Mean	Rank	Degree
purchase of advanced equipment and software.				
The bank exchanges technical expertise in new technologies.	0.75338	3.5900	08	High
The use of information technology contributes to maintaining the bank's market share.	0.67232	3.7500	06	High
Average for Information Technology Dimension	0.93	2.85		Moderate

Source: Prepared by the author based on SPSS outputs.

The analysis of responses regarding the bank's information technology reveals a generally high level of integration and effectiveness. The bank demonstrates strong capabilities in employing advanced technology, as evidenced by high mean scores for its modern IT equipment, systems, and sufficient ATMs, indicating a robust technological infrastructure. However, certain areas, such as email communication and consultations on technology acquisition, show moderate scores, suggesting opportunities for improvement. Notably, the bank's effective use of technology positively impacts its market share and profitability, reflecting its strategic role in supporting business objectives. Overall, the average score for the information technology dimension is moderate, with a mean of 2.85 and a standard deviation of 0.93, highlighting a generally favourable perception of the bank's technological capabilities while identifying areas for potential enhancement.

Table 8: Results of the Analysis of the Sample's Responses to Statements Related to the Second Dimension: Financial Inclusion

Statement	Standard Deviation	Mean	Rank	Degree
1. The bank provides ease of opening and using a bank account without obstacles.	0.51	4.14	01	High
2. The bank is attentive to the prompt completion of banking services.	0.53	3.98	05	High
3. The bank offers guarantees and endorsements for accessing banking services.	0.58	3.87	08	High
4. Branches of the bank provide similar services.	0.71	3.71	13	High
5. The bank selects agency locations that are easily accessible to customers.	0.65	3.76	11	High
Average for Financial Access Dimension	0.80	3.38		Moderate
6. The bank studies how any financial service is used before offering it to customers.	0.52	3.92	06	High

Statement	Standard Deviation	Mean	Rank	Degree
7. The bank provides a user guide for financial services to customers and regularly updates it.	0.66	3.74	12	High
8. Banking fees are not considered a barrier to using available banking services.	0.59	3.76	10	High
9. Customers are interested in using the bank's financial services, especially the new ones.	0.56	3.81	09	High
10. The bank facilitates and simplifies procedures related to its services.	0.50	4.03	04	High
Average for Financial Service Usage	0.69	3.32		Moderate
11. The efforts made in providing banking services by the bank to the customer are considered good compared to its competitors.	0.73	3.57	16	High
12. Banking services are provided by the bank to the customer in a timely manner.	0.82	3.61	15	High
13. The speed of service delivery.	0.85	3.48	17	Moderate
14. The bank introduces new services periodically.	0.79	3.64	14	High
15. There are laws and regulations designed to ensure and protect consumer rights and prevent fraud and unfair practices.	0.62	3.80	07	High
16. The bank maintains backups of software and data stored on computers.	0.53	4.08	02	High
17. The efforts made in providing banking services by the bank to the customer are considered excellent compared to its competitors.	0.60	4.04	03	High
Average for Service Quality	0.74	3.20		Moderate
Average for Financial Inclusion Dimension	0.76	2.90		Moderate

Source: Prepared by the author based on SPSS outputs

The analysis of responses on financial inclusion reveals key insights into the bank's performance in facilitating access to its services. The data indicates that the bank is highly effective in providing easy access to banking services and ensuring efficient service delivery, as reflected in the high mean scores for statements related to the ease of opening and using accounts, speed of service, and availability of guarantees for accessing banking services. Notably, the bank also scores high on the accessibility of branch locations and the provision of timely services.

Moderate scores are observed in areas such as the study of financial services before offering them to customers and the impact of banking fees on service utilisation. These suggest areas where improvements could enhance customer satisfaction and service uptake. Additionally, the bank's efforts in simplifying procedures and providing updated service guides contribute to a positive evaluation of its financial inclusion strategies.

Overall, the mean score for the financial inclusion dimension is moderate at 2.90, with a standard deviation of 0.76, indicating a generally favourable view of the bank's efforts in promoting financial inclusion while highlighting specific areas for potential improvement.

4. Results and Discussion

This section will test the study hypotheses using hierarchical multiple regression. The direct effect hypotheses measured by the first, second, and third sub-hypotheses will be examined to derive the study results.

4.1 Analysis of Findings

To test the main hypothesis, which asserts that information technology has a positive effect on financial inclusion, financial inclusion was included as the dependent variable in the model. Demographic control variables (gender, age, occupation, education level) were then entered to account for their potential effects. Information technology was subsequently introduced as the independent variable. The results of the regression analysis are summarised in the following table:

Table 9: Regression Analysis of the Impact of Information Technology on Financial Inclusion

Variable	Model 1	Model 2
	Coefficient (t)	Coefficient (t)
Gender	-0.07 (-0.77)	0.001 (0.01)
Age	0.08 (0.63)	0.05 (0.50)
Occupation	-0.15 (-1.13)	0.09 (0.78)
Education Level	-0.01 (-0.12)	-0.10 (-1.18)
Information Technology	/	0.60** (6.37)
R	0.14	0.56
R^2	0.02	0.31
Adjusted R^2	-0.02	0.27
F-Value	0.47	8.67**
ΔR^2	/	0.29

Source: Prepared by the author based on SPSS outputs

Notes:

- **Significant results are marked with** **.
- **t** values are in parentheses.

Model 1: In Model 1, which includes only the demographic control variables (gender, age, occupation, education level), the results indicate that these variables do not have a significant impact on financial inclusion. The coefficients for gender, age, occupation, and education level are all non-significant, and the R^2 value is 0.02, suggesting that only 2% of the variance in financial inclusion is explained by these demographic factors. Additionally, the F-value of 0.47 shows that the model is not statistically significant.

Model 2: In Model 2, information technology is introduced as the independent variable alongside the demographic controls. The results reveal a significant positive effect of information technology on financial inclusion ($\beta=0.60, p<0.01$), indicating that greater use of information technology is associated with higher levels of financial inclusion. The R^2 increases to 0.31, demonstrating that 31% of the variance in financial inclusion is now explained by the model, including the effect of information technology. The adjusted R^2 improves to 0.27, reflecting a better fit of the model when accounting for the number of predictors. The F-value of 8.67 is statistically significant, confirming that the inclusion of information technology significantly enhances the model's explanatory power.

Table10: Regression Analysis of Information Technology on Access to Financial Services

Variables	Model 1	Model 2
	Coefficient (t-value)	Coefficient (t-value)
Gender	-0.09 (-0.93)	-0.05 (-0.57)
Age	-0.09 (-0.67)	-0.10 (-0.79)
Occupation	0.12 (0.87)	0.23 (1.68)
Education Level	-0.09 (-0.89)	-0.13 (-1.32)
Information Technology	/	0.27* (2.55)
R	0.17	0.30
R^2	0.29	0.92
Adjusted R^2	-0.01	0.04
F-Value	0.72	1.91
ΔR^2	/	0.63
Δ F-Value	/	1.19
Sig of F for Model	0.579	0.099
Df	4.95	5.94
*p < 0.05; **p < 0.01*		

Source: Prepared by the author based on SPSS outputs

Model 1: In the first model, which includes only demographic control variables (gender, age, occupation, education level), the results indicate that these variables do not significantly influence access to financial services. The coefficients for gender, age, occupation, and education level are not statistically significant, with all t-values suggesting minimal impact. The R^2 value of 0.29 suggests that these demographic factors explain 29% of the variance in access to financial services. However, the F-value of 0.72 ($p = 0.579$) indicates that the model's overall explanatory power is not significant.

Model 2: The second model introduces information technology as an independent variable, while retaining the demographic controls. The addition of information technology reveals a significant positive effect on access to financial services (β=0.27, t = 2.55, $p < 0.05$). This model shows a substantial increase in R^2 to 0.92, demonstrating that information technology, along with demographic variables, explains 92% of the variance in access to financial services. The adjusted R^2improves to 0.04, indicating a better model fit with the inclusion of information technology.

Table 11: Regression Analysis of Information Technology on the Use of Financial Services

Variables	Model 1	Model 2
	Coefficient (t-value)	Coefficient (t-value)
Gender	-0.05 (-0.49)	0.000 (0.004)
Age	0.06 (0.47)	0.04 (0.36)
Occupation	-0.05 (-0.39)	0.10 (0.77)
Education Level	-0.12 (-1.16)	-0.17 (-1.80)
Information Technology	/	0.38** (3.62)
R	0.14	0.37
R^2	0.02	0.14
Adjusted R^2	-0.02	0.09
F-Value	0.48	3.05*
ΔR^2	/	0.12
Δ F-Value	/	2.57
Sig of F for Model	0.751	0.013
Df	4.95	5.94
*p < 0.05; **p < 0.01*		

Source: Prepared by the author based on SPSS outputs

Model 1: The first model, which incorporates only demographic control variables (gender, age, occupation, education level), shows that none of these variables significantly impact the use of financial services. Specifically, the coefficients for gender, age, occupation, and education level are not statistically significant, with all t-values being close to zero.

Model 2: When information technology is introduced as an independent variable in the second model, it significantly influences the use of financial services (β = 0.38, $p < 0.01$). The R^2 value increases to 0.14, indicating that 14% of the variance in the use of financial services is explained by the model, which includes the effect of information technology. The Adjusted R^2 rises to 0.09, reflecting a better model fit. The F-value of 3.05 is statistically significant (p = 0.013), confirming that the inclusion of information technology enhances the model's explanatory power.

Table 12: Regression Analysis of Information Technology on the Quality of Financial Services

Variables	Model 1	Model 2
	Coefficient (t-value)	Coefficient (t-value)
Gender	0.02 (0.25)	0.10 (1.18)
Age	0.28 (2.06)	0.25 (2.18)
Occupation	-0.24 (-1.82)	-0.004 (-0.03)
Education Level	-0.03 (-0.33)	-0.12 (-1.39)
Information Technology	/	0.57** (6.17)
R	0.21	0.56
R^2	0.04	0.32
Adjusted R^2	0.007	0.28
F-Value	1.16	8.91**
Δ R^2	/	0.28
Δ F-Value	/	7.75
Sig of F for Model	0.331	0.000
Df	4.95	5.94
*p < 0.05; **p < 0.01*		

Source: Prepared by the author based on SPSS outputs

Model 1: In the first model, which includes only demographic control variables (gender, age, occupation, education level), the results show that these variables have minimal impact on the quality of financial services. The coefficients for gender, age, occupation, and education level are not statistically significant, as indicated by their p-values.

Model 2: When information technology is introduced as an independent variable in Model 2, it demonstrates a significant positive effect on the quality of financial services ($\beta = 0.57$, $p < 0.01$). This indicates that greater use of information technology is associated with improved perceived quality of financial services. The R^2 value increases to 0.32, signifying that the model explains 32% of the variance in the quality of financial services. Adjusted R^2 improves to 0.28, reflecting a better fit of the model with the inclusion of information technology. The F-Value of 8.91 is statistically significant, confirming that the addition of information technology substantially enhances the model's explanatory power.

4.2 Discussion

The findings align with existing literature, which highlights that IT plays a crucial role in enhancing financial inclusion. Similar studies have shown that technology facilitates greater access to and usage of financial services, leading to improved service quality (Demirgüç-Kunt et al., 2015; Suri & Jack, 2016). The significant positive effects observed in this study are consistent with findings from other contexts, where IT integration has been linked to increased financial inclusion and service quality (Beck et al., 2009; Demirgüç-Kunt et al., 2018).

4.3 Challenges and Opportunities

- **Challenges**
  - **Implementation Issues**: BADR faces challenges related to the integration of IT solutions, including outdated infrastructure and resistance to change. The need for significant investment in modern IT systems and training for staff can be a barrier.
  - **Data Security and Privacy**: Ensuring the security and privacy of customer data remains a major concern, particularly as the use of IT increases.
- **Opportunities**
  - **Enhanced Accessibility**: The use of IT offers opportunities to improve access to financial services, especially in underserved areas. Digital platforms can bridge gaps by providing remote access to banking services.
  - **Increased Efficiency**: IT solutions can streamline operations, reduce costs, and enhance the quality of financial services, creating a more efficient banking environment.

5. Conclusion

In conclusion, the integration of information technology at the Agricultural and Rural Development Bank (BADR) in Jijel, Algeria, has demonstrated a positive impact on financial inclusion in rural areas. The study found that IT significantly enhances access to, use of, and the quality of financial services. Despite challenges related to outdated infrastructure, the opportunities for further improving financial inclusion through IT are substantial. Continued investment in technology and staff training is essential for maximising these benefits.

Study Findings:

- The regression analysis revealed a significant positive correlation between IT adoption and financial inclusion, with IT explaining 31% of the variance in financial inclusion. This highlights IT's crucial role in enhancing the accessibility and use of financial services, especially in underserved regions.
- IT was found to significantly improve access to financial services, accounting for 92% of the variance when combined with demographic factors. This suggests that digital platforms and technologies can bridge the gap in financial service provision in remote areas.
- The use of IT was also positively correlated with the increased use of financial services, explaining 14% of the variance. This indicates that IT facilitates easier and more widespread utilisation of banking services among rural populations.
- IT integration has a profound impact on the perceived quality of financial services, explaining 32% of the variance. Customers benefit from enhanced service delivery, efficiency, and reliability due to technological advancements.

Despite these positive outcomes, the study also identified challenges such as outdated infrastructure and resistance to change within BADR, which could hinder the full realisation of IT's benefits. However, the opportunities presented by

IT, particularly in improving access and operational efficiency, suggest that further investment in modernising technology and staff training could significantly enhance financial inclusion in rural Algeria.

In light of these findings, it is recommended that BADR continues to invest in upgrading its IT infrastructure and enhancing the digital literacy of its staff to maximise the potential benefits of IT in promoting financial inclusion across rural regions.

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