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Determinants of adoption of specific Islamic financial products by farmers in Marrakech-Safi, Morocco

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Abstract This study seeks to explore and identify the principal factors that shape Moroccan farmers' intention to adopt Islamic financial products, with a particular emphasis on the agricultural sector in the Marrakech-Safi region. Despite the national expansion of participatory banking in Morocco, the adoption rate among farmers remains relatively low, which raises critical questions about the determinants influencing their behavioral intention. The research framework is based on Rogers' Diffusion of Innovations (DOI) theory, which highlights five key perceived attributes of innovation relative advantage, compatibility, complexity, trialability, and observability. In addition to these theoretical dimensions, the study incorporates socio-demographic characteristics such as education, age, gender, and religiosity to provide a holistic understanding of the adoption process. A quantitative methodology was adopted, drawing on data collected from 387 farmers through a stratified random sampling technique to ensure representativeness across the region. The collected data were analyzed using a logistic regression model, complemented by robustness checks to verify the reliability of the findings. The results demonstrate that relative advantage, compatibility, and education have a strong and positive influence on farmers' intention to adopt Islamic financial services. Conversely, complexity and age negatively affect adoption decisions, while trialability and observability exhibit weak statistical significance. Gender was found to have no significant impact, whereas religiosity displayed a moderate but meaningful effect. This research represents one of the first empirical applications of the DOI model to Islamic finance adoption within Moroccan agriculture. It contributes to the academic literature by offering context-specific evidence from an underexplored population segment in North Africa. Despite its geographical limitation to a single region and its focus on intention rather than actual behavior, the study provides practical insights for policymakers and participatory banks. The findings highlight the importance of simplifying Islamic finance contracts, enhancing financial literacy, and increasing the visibility and accessibility of participatory banking products in rural communities.

Keywords: adoption, diffusion of innovations, farmers, Islamic finance, marrakech-safi region

1. Introduction

Over the past decade, Morocco has taken significant steps to integrate Islamic finance into its national financial system, with the dual objective of expanding financial inclusion and responding to the religious aspirations of a substantial portion of the population. The adoption of Law No. 103--12 on credit institutions, followed by the official introduction of participatory banks in 2017, marked a major milestone in this process. Since then, several Sharīʿah-compliant financial products, such as *Murābaḥah*, *Ijārah*, and *Mushārakah,* have been introduced to meet a variety of financing needs, including housing, vehicle acquisition, and the consumer credit Bank Al-Maghrib (2022) Boulahya et al. (2021). These developments reflect a broader global trend, as Islamic finance continues to expand steadily across many Muslim-majority countries El-Gamal (2006) Iqbal & Mirakhor (2011).

Nonetheless, the penetration of Islamic finance in Morocco remains relatively limited compared with that of conventional banking products. The latest report from Bank Al-Maghrib (2023) indicates that participatory loans account for only approximately 5.7% of the total outstanding credit within the banking system. This figure is particularly low in the agricultural sector, which plays a crucial role in Morocco's economy, employing approximately 38% of the active labor force and contributing between 12% and 14% of the national GDP HCP (2021); World Bank. (2020). Farmers, especially those living in rural areas, continue to rely on informal financing channels or turn to microfinance institutions. This behavior is often driven by a lack of trust, limited awareness, or a perceived mismatch between available banking products, including Islamic ones, and their financial needs (Srairi, 2010; Ezzahid & Elouaourti, 2022).

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This situation raises a key question: Why are Moroccan farmers, who seemingly adhere to the principles of Islamic finance, still reluctant to adopt participatory financial products? More specifically, what behavioral, socioeconomic, cognitive, or institutional barriers hinder this adoption? The question is particularly relevant in light of Morocco's strategic push toward greater financial inclusion, especially through the National Financial Inclusion Strategy (2019–2023), which aims to reduce disparities in access to credit across rural areas.

The Marrakech-Safi region, with its diverse agricultural landscape and strong growth potential, provides an ideal case study for this research. It encompasses both small-scale family farms and more structured agro-industrial operations, allowing for a better understanding of the heterogeneity in perceptions and behaviors regarding Islamic finance. However, to the best of our knowledge, no in-depth empirical study has been conducted to assess the intention to adopt participatory banking products in this region or to identify the specific factors influencing such decisions among farmers.

Therefore, the objective of this research is to explore the determinants of Moroccan farmers' intention to adopt Islamic financial products, with a particular focus on the Marrakech-Safi region. Drawing upon Diffusion of Innovations theory (Rogers, 2003) and integrating insights from behavioral models such as the Theory of Planned Behavior Ajzen (1991), this study aims to identify key religious, economic, psychological, and social variables that shape adoption intention. This work seeks to fill a clear academic gap while also offering practical guidance for policymakers seeking to better integrate participatory finance into rural development strategies.

2. Literature Review

2.1. Importance of Islamic Financial Products for Moroccan Farmers

Agriculture remains a strategic sector in Morocco, employing nearly 34% of the national workforce and contributing approximately 12% to the country's GDP World Bank (2023). Despite this significance, Moroccan farmers, particularly smallholders, continue to face persistent challenges in accessing formal financial services. These difficulties stem from various factors, including high collateral requirements, limited branch networks in rural areas, and a lack of products tailored to agricultural cycles; Crépon et al. (2015).

In this context, Islamic financial products present a promising alternative. Rooted in Sharia principles, these products avoid interest (*riba*), emphasize risk sharing, and promote ethical investment. Instruments such as *Murābaḥah* (cost-plus sale), *Ijārah* (leasing), *Salam* (forward contracts), and *Mushārakah* (joint ventures) are particularly suited to agricultural financing because of their flexibility, transparency, and potential for aligning with seasonal cash flows (Gait & Worthington, 2008; Abduh & Omar, 2012).

Many Moroccan farmers view Islamic finance not only as a religiously compliant option but also as a culturally legitimate and morally superior alternative to conventional credit (Omerani et al., 2022; Aassri & El Wali, 2020). This perception is especially strong in rural regions where Islamic values are deeply embedded in social practices Boubker et al. (2021). As such, Sharia-compliant finance could contribute to greater financial inclusion, particularly among segments traditionally excluded from the banking system Khmous et al. (2020).

Moreover, the rise of participatory banks in Morocco since the introduction of Law 103.12 has created institutional momentum for Islamic finance. The establishment of dedicated Islamic financial institutions such as Bank Al Yousr, Umnia Bank, and BTI Bank has expanded access points for rural populations Bank Al-Maghrib (2020). However, the actual penetration of Islamic products in the agricultural sector remains modest, largely due to a lack of awareness, limited literacy regarding Sharia-based contracts, and weak institutional outreach Hafiane et al. (2021); Adjaar et al. (2020).

Several authors argue that Islamic finance could respond to the risk aversion and low income variability tolerance of Moroccan farmers more effectively than could conventional loans. For example, Murābaḥah can provide structured installment-based financing with full transparency on cost and terms, which is often preferred in uncertain farming environments (Abdullah & Dusuki 2006; Kaleem & Wajid, 2009). Similarly, Salam contracts, where payments are made in advance for future agricultural production, can offer liquidity during planting seasons and reduce dependence on informal lenders (Ahmed, 2011; Moh'd et al., 2022).

Furthermore, Islamic finance aligns with the objectives of *Maqasid al-Sharia:* the preservation of wealth, livelihood, and dignity, which are especially relevant in rural development strategies Dusuki & Abdullah (2007). By integrating these ethical dimensions into agricultural financing, participatory banks may foster not only financial access but also social trust and community empowerment Fianto et al. (2018).

However, some authors caution that the potential of Islamic finance remains underutilized without adequate institutional support, targeted product development, and culturally adapted awareness campaigns Saiti et al. (2018). Regulatory frameworks and support mechanisms such as guarantees, subsidies, or partnerships with agricultural cooperatives are needed to increase product accessibility and trust among farmers.

2.2. Theoretical Foundations on the Determinants of Financial Product Adoption

Understanding how individuals adopt financial products, especially in rural or underserved communities, requires a theoretical framework that captures both behavioral and contextual dimensions. Over the past few decades, several theories have been developed and applied to model financial decision-making, particularly in relation to new or nonconventional financial instruments such as Islamic finance.

2.2.1. Theory of planned behavior (TPB)

Introduced by Ajzen (1991), the TPB posits that behavioral intention is driven by three main factors: attitude toward the behavior, subjective norms, and perceived behavioral control. This theory has been widely applied in Islamic finance adoption studies. For instance, Amin et al. (2011) demonstrated that the TPB explains customer intention to use Islamic home financing in Malaysia, whereas Saad et al. (2020) confirmed its applicability in analyzing (*Zakat*) payment behavior. In Morocco, Boubker et al. (2021) adapted the TPB to explain consumers' interest in participatory banking and reported that religiosity amplifies the role of subjective norms in shaping financial decisions.

However, the TPB is often criticized for its individual-centered focus, which may overlook the influence of product characteristics and institutional trust, both of which are crucial in rural financial behavior (Fishbein & Ajzen, 2010).

2.2.2. Technology acceptance model (TAM)

TAM, developed by Davis (1989), centers on two main constructs: perceived usefulness and perceived ease of use. It has been extensively used in the digital and mobile banking contexts of Venkatesh & Davis (2000) and Zhou (2011) and has also been adapted to study Islamic fintech adoption Shaikh & Karjaluoto (2015). In agricultural settings, however, the model's relevance may be limited by low digital literacy and limited access to technology, particularly in developing countries Mutua & Oyugi (2022).

2.2.3. Unified theory of acceptance and use of technology (UTAUT)

The UTAUT model, proposed by Venkatesh et al. (2003), builds on the TAM and integrates variables such as performance expectancy**,** effort expectancy**,** social influence, and facilitating conditions. UTAUT has gained traction in Islamic finance studies, including digital payment systems Alalwan (2020) and Islamic crowdfunding platforms Sukmana et al. (2023). Nevertheless, UTAUT is typically applied in technology-intensive contexts, which limits its suitability for nondigital product environments such as agricultural finance.

2.2.4. Diffusion of Innovations (DOI) Theory

Among all the models, Rogers' Diffusion of Innovations (DOI) theory (2003) is arguably the most appropriate for studying the adoption of Islamic financial products in rural and agricultural settings. DOI focuses on how the relative advantages, compatibility, complexity, trialability, and observability of innovation characteristics shape individual adoption behavior. These attributes are particularly relevant for understanding farmer decision-making, where product-specific perceptions and peer influence matter greatly Pannell et al. (2006); Jamshidi & Kazemi (2019).

The DOI has been used in Islamic banking adoption studies in diverse contexts. Amin (2012) reported that compatibility and observability are key drivers of Islamic mobile banking adoption in Malaysia. Kaleem & Wajid (2009)

applied DOI to analyze the adoption of Sharia-compliant agricultural loans in Pakistan, emphasizing the roles of relative advantage and simplicity. Similarly, Kaabachi & Obeid (2016) confirmed the explanatory power of DOI attributes in South Asian Islamic banking uptake.

Compared with the TPB and TAM, DOI offers a product-centric lens rather than a purely attitudinal lens. This makes it especially suited to rural agricultural contexts, where perceptions of complexity, community influence, and trialability are often more decisive than abstract attitudes or technological parameters (Purwanto et al., 2022; Omerani et al., 2022).

Recent studies recommend the integration of multiple frameworks to capture the multidimensionality of adoption behavior. For example, Abrahão et al. (2016) combined UTAUT and DOI to study mobile banking in Brazil, whereas Gounaris & Koritos (2008) proposed a model that links innovation attributes with trust, perceived risk, and institutional reputation. In Islamic finance, such integrated models may provide better insights into how religiosity, social norms, institutional factors, and product features interact.

2.3. Empirical Evidence on the Determinants of Financial Product Adoption

Numerous empirical studies have investigated the factors influencing the adoption of Islamic financial products, often using behavioral models such as the TPB, TAM, or DOI. In line with Rogers' (2003) diffusion of innovations (DOI) theory, this study examines five innovation-related constructs, namely, relative advantage (AVR), compatibility (CPT), complexity (CPX), trialability (TES), and observability (OBSV), as well as four demographic variables: education (EDU), age (AGE), gender (GEN), and religiosity (REL)**.** The following section summarizes the empirical literature supporting each of these determinants.

2.3.1. Relative advantage (AVR)

Relative advantage refers to the perceived superiority of Islamic financial products over conventional alternatives. It is one of the most consistently significant predictors of adoption intention Rogers (2003). Amin (2008) reported that Malaysian consumers were more likely to adopt Islamic credit cards when they perceived them as offering greater ethical and financial benefits. In rural Indonesia, Utama et al. (2019) reported that relative advantage had the strongest effect on the adoption of Sharia microfinance. In Morocco, Kalim et al. (2010) showed that farmers were motivated by the belief that participatory finance provides interest-free and transparent alternatives that are better aligned with their risk profile.

H1: Relative advantage positively influences farmers' intention to adopt Islamic financial products.

2.3.2. Compatibility (CPT)

Compatibility captures the extent to which an innovation aligns with users' values, beliefs, and experiences. In the context of Islamic finance, alignment with religious principles and rural social norms is particularly important. Gait and Worthington (2008) emphasized that the cultural fit of Islamic contracts enhances their acceptance in Muslim-majority regions. Empirical evidence from Morocco Omerani et al. (2022) suggests that farmers are more likely to consider participatory products when they perceive them as consistent with their moral values and agricultural practices.

H2: Compatibility has a positive effect on adoption intention.

2.3.3. Complexity (CPX)

Complexity refers to the perceived difficulty in understanding or using a product. High complexity typically reduces adoption rates (Rogers, 2003). Several studies have shown that Islamic financial instruments, especially those involving layered contracts such as Murābaḥah or Ijārah, can be perceived as overly technical by less-educated or rural clients Hafiane et al., 2021; Moh'd et al., 2022). In Pakistan, Kaleem & Wajid (2009) reported that complexity negatively affects the likelihood of Islamic finance adoption, particularly among farmers with limited formal education.

H3: Perceived complexity negatively affects adoption intention.

2.3.4. Trialability (TES)

Trialability refers to the degree to which a product can be tested or experimented with before full commitment. In communal societies, the ability to "try and see" is essential for building confidence. Amin et al. (2013) reported that trialability increased mobile Islamic banking adoption. However, in the Moroccan agricultural context, limited product awareness and rigid financing processes may reduce trialability Adjaar et al. (2020).

H4: Trialability positively influences adoption intention.

2.3.5. Observability (OBSV)

Observability refers to how visible the benefits of an innovation are to others. Studies suggest that social learning through observing peers or community members can strongly influence adoption decisions, particularly in rural settings Pannell et al. (2006). In a study conducted in Indonesia, Utama et al. (2019) demonstrated that observability significantly influenced microfinance uptake among farmers. In Morocco, this effect is also present, although it is more limited due to the relatively low number of Islamic finance users in rural areas Boubker et al. (2021).

H5: Observability positively affects adoption intention.

2.3.6. Education (EDU)

Education is often associated with increased financial literacy and openness to innovation. Higher education levels correlate with a better understanding of Islamic finance contracts, increasing the likelihood of adoption (Amin et al., 2011). In the MENA region, Kaleem et al. (2018) reported that education significantly influenced farmers' willingness to shift from informal financing mechanisms to Sharia-compliant financing mechanisms.

H6: Higher education levels increase the likelihood of adoption.

2.3.7. Age (AGE)

Age may reflect openness to change or innovation. Some studies report a negative relationship, suggesting that younger individuals are more willing to experiment with new financial solutions Shaikh & Karjaluoto (2015). In Morocco, Boubker, Douayri and Ouajdouni (2021) reported that older farmers were more hesitant to adopt participatory banking services due to risk aversion and unfamiliarity.

H7: Age negatively affects adoption intention.

2.3.8. Gender (GEN)

Empirical findings on gender are mixed. While some research indicates that men are more likely to engage with financial services, others show minimal differences when access is equal to Gait & Worthington (2008). In rural Morocco, Hafiane et al. (2021) reported no statistically significant difference in adoption intentions between male and female farmers.

H8: Gender does not significantly influence adoption intention.

2.3.9. Religiosity (REL)

Religiosity is a key determinant in Islamic finance studies. Individuals with higher levels of religious commitment are more likely to choose financial products that comply with Islamic law (Dusuki & Abdullah, 2007; Amin et al., 2011). In rural areas, where religion often guides economic choices, religiosity has a particularly strong influence Aassri & El Wali (2020).

H9: Increased religiosity positively influences adoption intention.

3. Methodology

3.1. Research Design and Sampling

This study employs a quantitative, cross-sectional research design aimed at identifying the determinants of Moroccan farmers' intention to adopt Islamic financial products. The target population consists of SMEs in the Marrakech-Safi region, where agriculture remains a key economic activity.

A stratified random sampling approach was applied to ensure that different subgroups of farmers were proportionally represented. The region was first stratified by province (Marrakech, Safi, Chichaoua, El Kelaâ), and within each stratum, farmers were randomly selected from municipal agricultural cooperatives and registry lists. Stratification ensured representativeness on the basis of farm size, geographic location, and exposure to banking services.

The sample size was calculated via Yamane's (1967) formula with a 95% confidence level and a 5% margin of error. From a population of approximately 50,000 active farmers, a minimum sample size of 382 was determined. A total of 600 questionnaires were distributed; 387 valid responses were retained after data cleaning, yielding a response rate of 64.5%.

3.2. Data collection and cleaning

Primary data were collected via face–to-face structured interviews conducted between [02/2024--09/2024] in collaboration with local agricultural extension officers. A pilot test was conducted with 30 farmers to refine the questionnaire for clarity and cultural relevance.

The final questionnaire consisted of five parts: sociodemographic characteristics, awareness of Islamic finance, perception-based constructs (based on DOI), a religiosity scale, and adoption intentions. Data cleaning involves checking for missing values, inconsistencies, and outliers. Only complete and logically consistent questionnaires were included in the final dataset.

3.3. Variable Description and Measurement

Table 1 demonstrate the dependent variable is INTAi (Adoption Intention), a binary variable coded 1 if the respondent indicated the intention to adopt Islamic financial products and 0 otherwise.

Independent variables were derived from Rogers' (2003) diffusion of innovations theory and measured on 5-point Likert scales (1 = strongly disagree, 5 = strongly agree):

Table 1 Variable Description and Measurement.

Variable	Description	Measurement Items	Source
AVR	Relative advantage (e.g., ethical, low-risk, interest-free)	4 items	Amin (2008), Kaleem & Wajid (2009)
CPT	Compatibility with farming values and Islamic beliefs	4 items	Gait & Worthington (2008), Omerani et al. (2022)
CPX	Perceived complexity of contracts or procedures	4 items	Hafiane et al. (2021), Amin (2012)
TES	Opportunity to test Islamic products before full use	3 items	Purwanto et al. (2022), Amin et al. (2013)
OBSV	Visibility of benefits among peers or neighbors	3 items	Pannell et al. (2006), Jamshidi & Kazemi (2019)

The control variables include:

- EDU: Years of formal education
- AGE: Respondent's age (in years)
- GEN: Gender (1 = male, 0 = female)
- REL: Religiosity measured via a composite index (3 items adapted from Dusuki & Abdullah, 2007)

4. Results

This section presents the empirical findings of the study, focusing on the factors influencing the intention to adopt Islamic financial products among farmers in the Marrakech-Safi region. The results are discussed in the context of the literature, with a detailed presentation of confirmatory factor analysis, regression analysis, and robustness checks.

Confirmatory factor analysis (CFA) was conducted to assess the reliability and validity of the measurement scales used in the study, with a focus on key indicators such as Cronbach's alpha, composite reliability (CR), and average variance extracted (AVE) to ensure convergent validity. The results presented in Table 2 demonstrate strong convergent validity across the constructs. Specifically, the AVE for perceived compatibility is 0.93202, which significantly exceeds the standard threshold of 0.50, indicating that a substantial amount of variance is explained by the construct relative to the variance due to measurement error. This high AVE value suggests that the items intended to measure "perceived compatibility" are highly correlated and capture the construct effectively.

Moreover, the Cronbach's alpha for perceived complexity is 0.70914, which, while only slightly above the conventional threshold of 0.70, still indicates adequate internal consistency. This suggests that the items within the perceived complexity construct are reasonably homogeneous, supporting the reliability of the scale. Overall, these results align well with established benchmarks in the literature Hair et al. (2010), confirming that the constructs used in this study are both reliable and valid, providing a strong foundation for further analysis.

Discriminant validity was assessed via the Fornell–Larcker criterion, which compares the square root of the AVE values with the correlations between constructs to determine whether each construct is more closely related to its own measures than to those of other constructs. The results in Table 3 indicate that the square root of the AVE for "Relative Advantage" is 0.822, which is higher than its correlation with other constructs, such as 0.764 with "Perceived Compatibility." This finding confirms the discriminant validity of "Relative Advantage," demonstrating that it is sufficiently distinct from other constructs measured in the study. The clear distinction between "Relative Advantage" and other constructs is essential, as it ensures that the model accurately captures the various dimensions influencing adoption behavior. This separation aligns with the guidelines set forth by Fornell and Larcker (1981), which emphasize the importance of establishing discriminant validity to validate the theoretical structure of the model. The confirmation of discriminant validity in this context strengthens the credibility of the study's findings, ensuring that each construct represents a unique aspect of the adoption process.

Table 2 Confirmatory Factor Analysis Results (Convergent Validity).

Variable	Cronbach's Alpha	Composite Reliability	AVE
Relative Advantage	0.80101	0.98651	0.67498
Perceived Compatibility	0.85296	0.80325	0.93202
Perceived Complexity	0.70914	0.89842	0.92442
Testability	0.74081	0.76151	0.82354
Observability	0.87074	0.95818	0.79480

Table 3 Discriminant Validity (Fornell–Larcker Criterion).

Variable	Relate Advage	Compaibility	Complexity	Testability	Observability
Relative Advantage	0.822	0.764	0.674	0.651	0.631
Perceived Compatibility	0.764	0.883	0.681	0.659	0.623
Perceived Complexity	0.674	0.681	0.844	0.653	0.619
Testability	0.651	0.659	0.653	0.824	0.634
Observability	0.631	0.623	0.619	0.634	0.875

The results, as shown in Table 4, indicate an F statistic of 0.776959, with a p value of 0.3786. This p value, which is well above the conventional significance level, suggests that there is no evidence of omitted variable bias in the model.

Table 5 presents a comprehensive overview of the distribution of responses for each key variable, including measures such as the mean, median, maximum, minimum, and standard deviation. The results show that the mean value for "Relative Advantage" (AVR) is 3.1318, suggesting that respondents generally perceive a moderate level of benefit from adopting Islamic financial products. This moderate perception indicates that, while the benefits are recognized, they may not be overwhelmingly compelling across the respondent pool.

Additionally, the standard deviation for perceived complexity (CPX) is 1.4195, which reflects considerable variability in respondents' opinions regarding the complexity of these products. This significant variation suggests that while some individuals may find products easy to understand and use, others perceive them as highly complex. This disparity in perceptions could pose a barrier to adoption, particularly for segments of the population that are less familiar with financial products or have lower levels of financial literacy. These insights underline the importance of addressing perceived complexity to enhance the broader acceptance of Islamic financial products.

Referring to Table 5, the Ramsey RESET test was conducted to evaluate the adequacy of the model specification and to check for any potential omitted variable bias. This outcome implies that the functional form of the model is correctly specified, meaning that the model likely includes all relevant variables that influence the adoption of Islamic financial products. The

absence of omitted variable bias enhances the reliability of the model, increasing confidence in the robustness of the regression results. This robustness is crucial for ensuring that the conclusions drawn from the analysis are valid and that the model effectively captures the key factors influencing adoption behavior.

Table 4 Descriptive Statistics of the Key Variables.

	Mean	Median	Maximum	Minimum	Std, Dev,
INTA	0,4987	0,0000	1,0000	0,0000	0,5006
AVR	3,1318	3,0000	4,7500	1,2500	1,4200
CPT	2,9767	3,0000	4,6000	1,2000	1,3816
CPX	3,0904	3,0000	5,0000	1,2500	1,4195
TES	2,9173	3,0000	4,6667	1,0000	1,4007
OBSV	2,9897	3,0000	4,7500	1,0000	1,4342
EDU	10,7933	11,0000	15,0000	6,0000	2,8754
AGE	40,6227	41,0000	55,0000	27,0000	8,2319
GEN	0,9580	1,0000	1,0000	0,0000	0,2002
REL	2,9690	3,0000	5,0000	1,3333	1,3597

Table 5 Ramsey RESET Test Results.

Specification: INTA C AVR CPT CPX TES OBSV EDU AGE GEN REL			
Omitted Variables: Squares of fitted values			
	Value	df	Probability
t-statistic	0.881453	376	0.3786
F-statistic	0.776959	(1, 376)	0.3786
Likelihood ratio	0.798864	1	0.3714

In Table 6, variance inflation factors (VIFs) were calculated to assess the presence of multicollinearity among the independent variables in the model. Multicollinearity occurs when two or more predictor variables are highly correlated, which can inflate the standard errors of the coefficients and make it challenging to determine the significance of individual predictors. As presented in Table 5, the variance inflation factor (VIF) for perceived compatibility (CPT) is 1.018523, which is very close to 1.

This low VIF value indicates minimal multicollinearity, suggesting that "perceived compatibility" is largely independent of the other variables in the model. The consistency of low VIF values across all variables in the study indicates that multicollinearity is not a concern in the current model. This lack of multicollinearity enhances the reliability of the regression coefficients, ensuring that the effects of individual predictors on the dependent variable can be interpreted with confidence. Crucial for ensuring that the conclusions drawn from the analysis are valid and that the model effectively captures the key factors influencing adoption behavior.

Table 6 Variance Inflation Factors.

Variable	Coefficient Variance	Uncentered VIF	Centered VIF
C	0.043774	67.04176	NA
AVR	0.000340	5.630989	1.018323
CPT	0.000349	5.873953	1.018523
CPX	0.000361	5.747217	1.006191
TES	0.000355	5.514635	1.035718
OBSV	0.000328	5.962667	1.024134
EDU	8.78E-05	15.92879	1.039921
AGE	9.90E-06	26.50087	1.038033
GEN	0.002648	2.043512	1.013835
REL	0.000345	5.712767	1.016552

Confidence ellipses provide a visual representation of the variance–covariance structure of the data, which can be used to assess the distributions and relationships among variables. As depicted in Figure 1, the confidence ellipse shows that 95% of the data points fall within the ellipse, which supports the assumption of bivariate normality in the dataset. This graphical confirmation is crucial, as it verifies that the underlying assumptions of the regression analysis are met, thereby ensuring the validity of the inferences drawn from the model. The fact that the data adhere to the expected normal distribution strengthens the credibility of the regression results. Visual checks such as these are particularly important when working with complex models, as they provide an additional layer of validation for the statistical assumption and help to ensure the robustness of the analysis.

A histogram of residuals was generated to evaluate the distribution and normality of the residuals in the regression model. Figure 2 shows that the residuals are approximately normally distributed, with a mean of -0.019859 and a standard deviation of 0.390355. The slight skewness of 0.016213, which is close to zero, indicates a nearly symmetric distribution of

errors. This near-normal distribution of residuals supports the assumption of normality, which is a crucial requirement for the validity of hypothesis tests and the accuracy of confidence intervals in regression analysis. Ensuring that residuals are normally distributed confirms that the model's predictions are reliable and that the statistical inferences drawn from the regression analysis can be trusted. This step is essential in validating the overall robustness and credibility of the model.

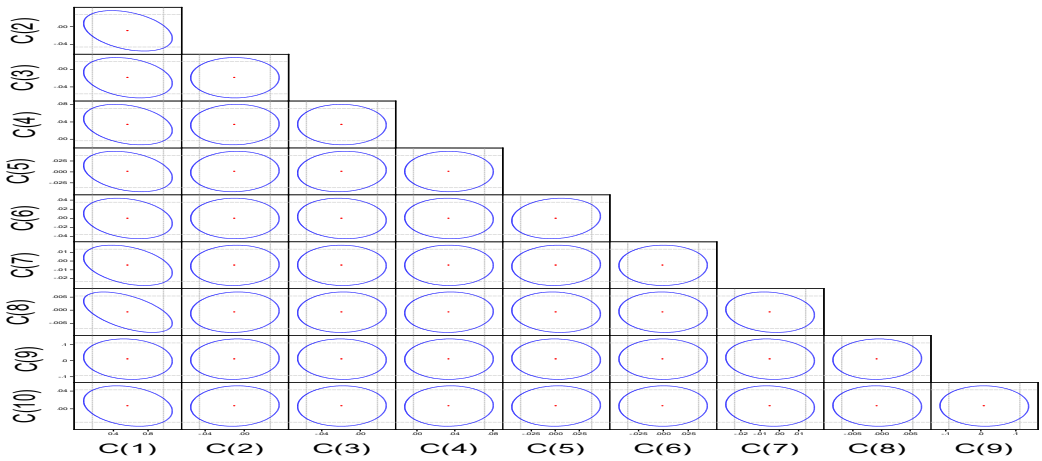

Figure 1 Confidence Ellipses.

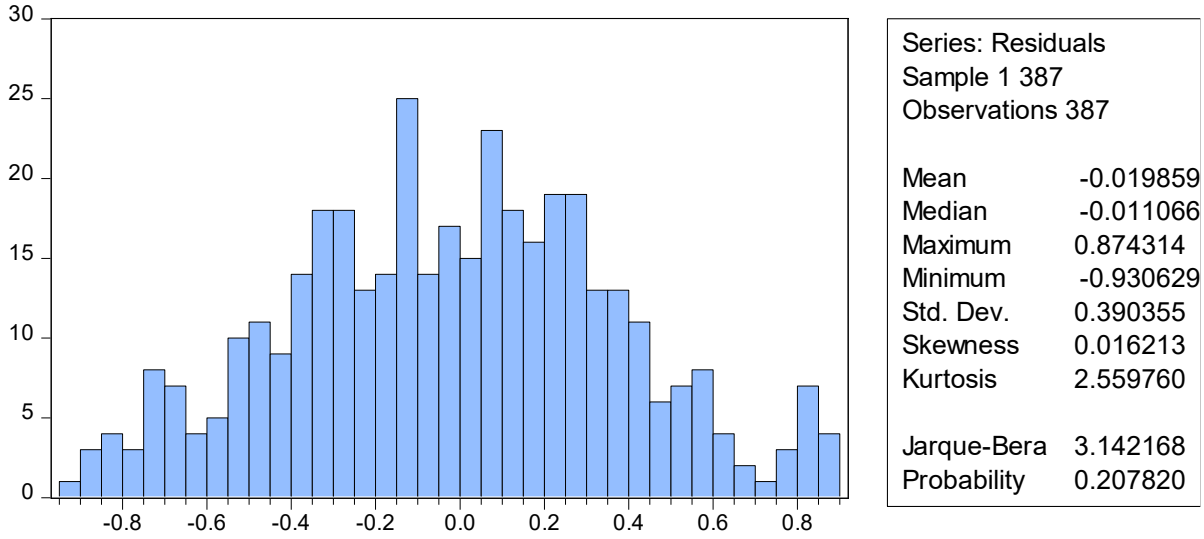

Figure 2 Histogram of residuals.

The Breusch–Pagan–Godfrey test was conducted to detect the presence of heteroskedasticity in the regression model, which refers to the situation where the variance of the error terms is not constant across observations. As shown in Table 7, the F statistic from the Breusch–Pagan–Godfrey test is 0.905030, with a p value of 0.5208. This p value is well above the conventional significance level, indicating that heteroskedasticity is not a significant issue in the model.

The absence of heteroskedasticity implies that the error terms exhibit constant variance, which is a key assumption in linear regression analysis. This constancy is crucial for ensuring that the model's estimates are reliable and that the standard errors of the coefficients are accurate. By confirming that heteroskedasticity is not present, these results bolster the robustness of the model and the validity of the conclusions drawn from the data, ensuring that the inferences made are sound and dependable.

Table 7 Breusch–Pagan–Godfrey Heteroscedasticity Test Results.

Statistique	Valeur	Probabilité
F-statistic	0.905030	Prob. F(9,377) = 0.5208
Obs*R-squared	8.184496	Prob. Chi-Square(9) = 0.5157
Scaled explained SS	0.234560	Prob. Chi-Square(9) = 1.0000

DFFITS values were calculated to assess the influence of individual observations on the overall model estimates, particularly to identify any potential outliers that might disproportionately impact the regression results. As illustrated in Figure 3, most DFFITS values fall within the threshold of ±0.3, indicating that no single observation exerts an excessive influence on

the model's estimates. This outcome suggests that the model is not unduly affected by outliers, which is critical for ensuring the stability and reliability of the regression coefficients. By confirming that no individual data point disproportionately affects the results, the integrity of the model is maintained, allowing for more accurate and trustworthy inferences. This assessment is particularly important in regression analysis, where the presence of influential outliers can skew the results and lead to misleading conclusions.

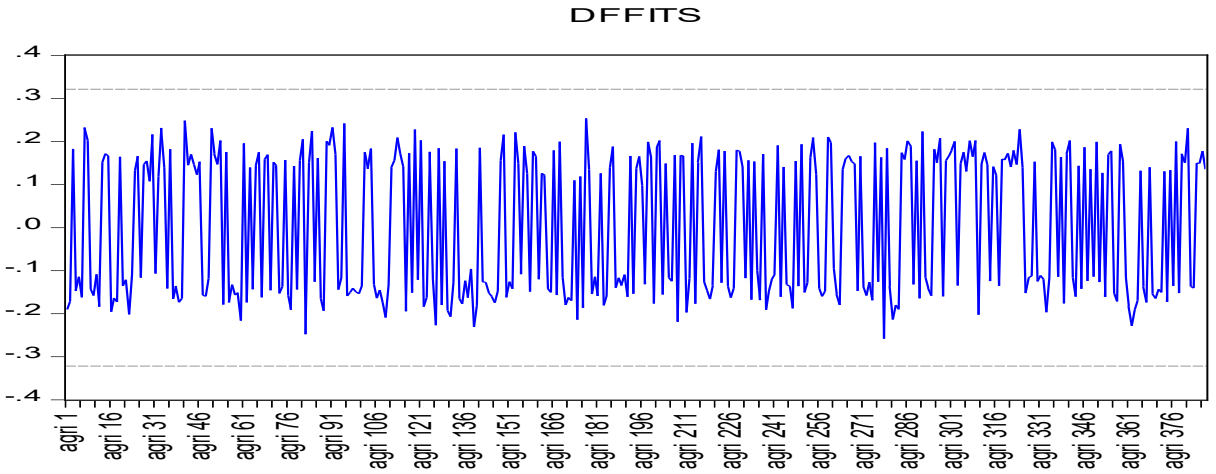

Figure 3 DFFITS values.

COVRATIO values were calculated to evaluate the impact of each individual observation on the overall fit of the regression model, particularly to determine if any observation is exerting an undue influence on the model's predictive accuracy. As shown in Figure 4, the majority of COVRATIO values fall within the acceptable range of 0.5--1.5.

This distribution suggests that the influence of individual observations on the overall model fit is within acceptable limits, meaning that no single observation disproportionately affects the model's performance. The fact that the COVRATIO values remain within this range further confirms the robustness and reliability of the model, ensuring that the predictive power of the model is not compromised by outliers or overly influential data points. This validation step is crucial for maintaining the accuracy and dependability of the regression analysis.

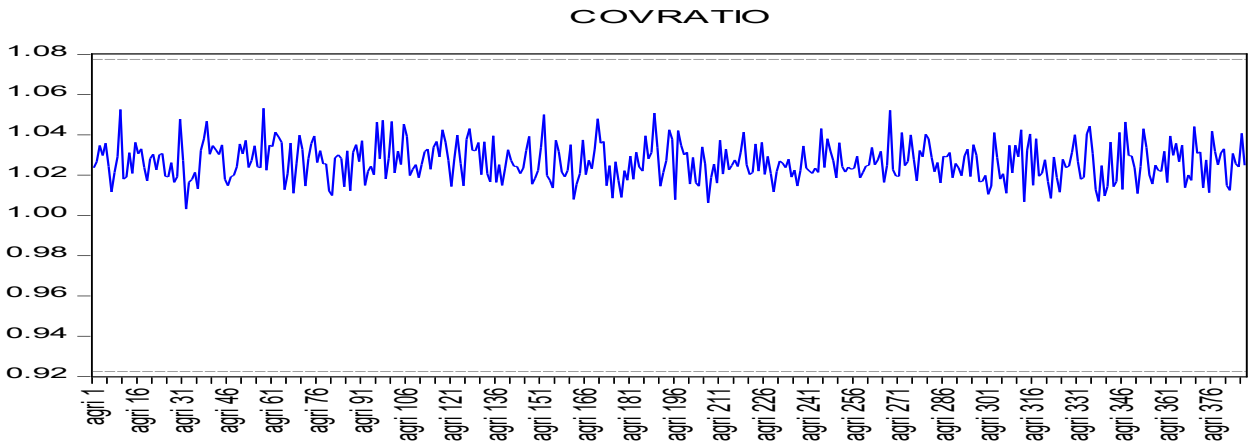

Figure 4 COVRATIO values.

The Hat matrix values were calculated to identify observations with high leverage, which could exert a significant influence on the regression model. As depicted in Figure 5, the Hat matrix values indicate that most observations have low leverage, with values well below the threshold of 0.3. This distribution suggests that the model is not overly influenced by any particular data points, meaning that no single observation has an undue effect on the overall regression results. The low leverage values reinforce the robustness of the model, ensuring that the conclusions drawn from the regression analysis are both reliable and valid. By confirming that the model is not disproportionately affected by high-leverage points, the integrity of the analysis is maintained, allowing for more accurate and dependable inferences.

The logit regression results, as presented in Table 8, offer crucial insights into the factors influencing farmers' intentions to adopt Islamic financial products. The analysis of the five main variables derived from Rogers' diffusion of innovations theory, alongside control variables such as education, age, gender, and religiosity, reveals important patterns.

First, the positive and statistically significant coefficient for Relative Advantage at the 1% level (p value = 0.0006) indicates that as farmers perceive greater benefits in Islamic financial products than in conventional products, they are more inclined to adopt them. This finding underscores the critical role that perceived benefits, such as compliance with religious principles and potentially lower costs, play in the decision-making process. The strong support for Hypothesis 1 (H1) aligns with the literature, which emphasizes the importance of perceived advantages in driving the adoption of financial innovations.

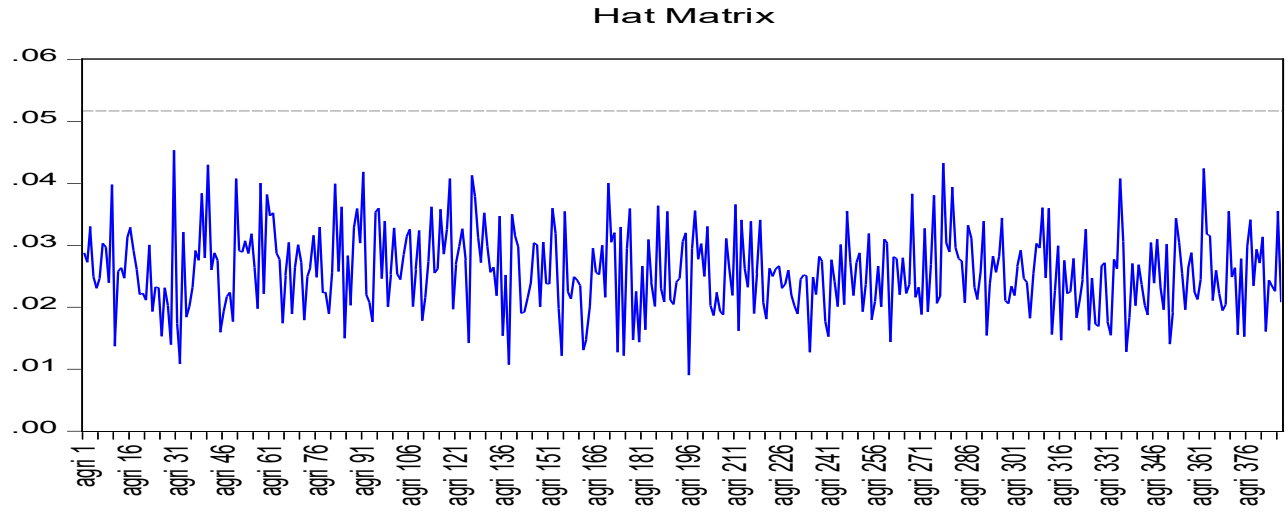

Figure 5 Hat Matrix Values.

Table 8 Results of the logit regression analysis.

Dependent Variable: INTA				
Method: ML - Binary Logit (Newton–Raphson/Marquardt steps)				
Sample: 1 387				
Included observations: 387				
Convergence achieved after 3 iterations				
Coefficient covariance computed using observed Hessian				
Variable	Coefficient	Std. Error	z-Statistic	Prob.
C	7,63444	2,83762	2,69044	***0,00745
AVR	11,25594	4,07400	2,76287	***0,00600
CPT	13,21116	6,07502	2,17467	**0,03026
CPX	-16,39184	6,07649	-2,69758	***0,00729
TES	5,15894	4,07548	1,26585	0,20633
OBSV	5,08477	3,07260	1,65488	*0,09876
EDU	3,83846	2,03760	1,88381	*0,06034
AGE	-21,33146	8,01261	-2,66224	***0,00809
GEN	0,23800	1,20633	0,19730	0,84370
REL	5,52780	3,07445	1,79798	*0,07296

Similarly, Perceived Compatibility also has a positive and significant effect at the 5% level (p value = 0.0303), suggesting that when Islamic financial products are seen as aligning well with existing farming practices and values, the likelihood of adoption increases. This finding supports Hypothesis 2 (H2) and highlights the need for new financial products to be congruent with farmers' current knowledge and practices. The consistency of this finding with prior research further emphasizes the importance of compatibility as a key determinant in the adoption of new technologies and practices, particularly in the agricultural sector.

On the other hand, the negative and statistically significant coefficient for perceived complexity at the 1% level (p value = 0.00073) indicates that greater perceived complexity significantly reduces the likelihood of adopting Islamic financial products. This result, which supports Hypothesis 3 (H3), suggests that if these products are seen as difficult to understand or use, farmers are less likely to adopt them. This finding is consistent with Rogers' theory, which posits that complexity is a significant barrier to the adoption of innovations, especially in populations with varying levels of financial literacy.

In contrast, the coefficient for Trialability, although positive, is not statistically significant (p value = 0.20633), indicating that the opportunity to trial Islamic financial products before fully committing does not have a significant effect on adoption intentions. Consequently, Hypothesis 4 (H4) is not supported. This outcome suggests that farmers may prefer more straightforward adoption processes or that the perceived complexity of these products overshadows any benefits associated with trialability.

Observability, however, shows a positive and marginally significant effect at the 10% level (p value = 0.09876), indicating that when the benefits and outcomes of using Islamic financial products are visible to farmers, their likelihood of adoption increases, although to a lesser extent than other factors do. This result supports Hypothesis 5 (H5), which aligns with the notion that visible success stories and peer experiences can significantly drive the adoption of new practices.

The analysis of control variables provides additional insights. The positive and significant coefficient for education at the 10% level (p value = 0.06034) suggests that more educated farmers are more likely to adopt Islamic financial products, possibly due to a better understanding of their benefits and complexities. Conversely, the negative and significant coefficient for age at the 1% level (p value = 0.00081) indicates that older farmers are less inclined to adopt these products, potentially because of greater resistance to change or a preference for traditional financial practices. However, gender does not have a statistically significant effect, indicating that there is no notable difference in adoption intentions between male and female farmers. Finally, religiosity emerges as a significant factor, with a positive coefficient at the 10% level (p value = 0.07296), suggesting that more religious farmers are more likely to adopt Islamic financial products, which is consistent with expectations that religious values drive the adoption of Sharia-compliant financial services.

In summary, the results presented in Table 7 underscore the importance of addressing perceived complexity and enhancing the visibility of successful adoption cases to encourage the broader use of Islamic financial products among farmers in the Marrakech–Safi region. While there is a general willingness to adopt these products, efforts to simplify the offerings and better align them with existing practices could significantly increase adoption rates. These findings offer actionable insights for practitioners and policymakers aiming to promote the adoption of Islamic financial products in similar contexts.

The findings of our study align with several conclusions presented in the literature, providing valuable insights into the factors influencing the adoption of Islamic financial products among farmers in the Marrakech–Safi region. By examining each dimension of Rogers' diffusion of innovations theory, we can situate our results within the broader theoretical framework and draw meaningful comparisons with previous studies.

5. Discussion

The discussion interprets the empirical findings in light of Rogers' (1995) Diffusion of Innovations Theory and existing literature on Islamic finance adoption. The results confirm that certain innovation attributes particularly *relative advantage*, *compatibility*, and *complexity* play pivotal roles in shaping adoption intentions among farmers.

First, the positive and significant influence of Relative Advantage corroborates the findings of Purwanto et al. (2022) and Sattar et al. (2020), who reported that perceived benefits, such as Sharia compliance and costeffectiveness, strongly encourage adoption. This indicates that farmers are more likely to embrace Islamic financial products when they perceive tangible benefits over conventional options. Promoting the religious and economic value-added of these products is therefore critical to fostering adoption.

Second, Compatibility also exerts a positive effect, consistent with Purwanto et al. (2022). When Islamic financial products align with farmers' existing practices and socio-cultural values, their likelihood of acceptance increases. This highlights the necessity for participative banks to design products that fit seamlessly within local agricultural realities, minimizing perceived disruption to traditional practices.

Third, Perceived Complexity negatively affects adoption, aligning with the conclusions of Rogers (1995) and Davis (1989). Products viewed as complicated or difficult to understand discourage engagement, especially among farmers with limited financial education. This finding emphasizes the need for simplified product designs, clear communication, and targeted financial literacy programs to overcome cognitive barriers.

In contrast, Trialability shows no significant impact on adoption, diverging from results by Venkatesh et al. (2003) and Purwanto et al. (2022). The inability to "test" Islamic financial products before full engagement may explain this outcome, as these instruments are contractual and not easily pilotable. This suggests that perceived simplicity and trust in institutions could substitute for trial experience in the Moroccan agricultural context.

The variable Observability exerts a modest yet positive influence, aligning with Bangash (2020) and Sattar et al. (2020). Farmers who witness visible success stories of peers using Islamic financing tend to be more inclined to adopt. Enhancing the visibility of such success cases through cooperative networks, rural workshops, and local testimonies could strengthen trust and diffusion dynamics.

Finally, control variables further refine our understanding. Education increases adoption likelihood, echoing findings that educated farmers are better positioned to grasp the mechanisms of Islamic finance. Age, conversely, negatively correlates with adoption, confirming that younger farmers are more open to innovative practices. The positive relationship between religiosity and adoption intention aligns with prior studies emphasizing faith-based motivations (Amin et al., 2011).

In summary, this study demonstrates that the diffusion of Islamic financial innovations among Moroccan farmers is driven primarily by perceived advantage, compatibility, and simplicity. To enhance adoption, policymakers and participative banks should focus on reducing informational complexity, aligning financial offers with agricultural needs, and promoting the visible success of early adopters. These insights contribute both to the academic literature on Islamic finance adoption and to the practical design of inclusive rural financial strategies.

6. Conclusions

This study explored the key determinants influencing the intention of Moroccan farmers to adopt Islamic financial products, with a focus on the Marrakech-Safi region. Using the diffusion of innovations (DOI) framework, the research highlighted the significance of relative advantage, compatibility, and education as positive drivers of adoption, whereas complexity and age were shown to negatively impact intention. The findings suggest that although Islamic finance resonates with the religious and ethical values of rural communities, actual uptake remains limited due to issues of accessibility, product design, and low visibility.

6.1. Recommendations for Stakeholders

For policymakers, there is a critical need to explicitly integrate Islamic finance into rural development strategies. This involves expanding financial education programs tailored to populations with low literacy levels, promoting awareness campaigns through agricultural cooperatives and local media channels, and establishing regulatory incentives that encourage banks to serve rural clients with simplified and adapted financial products. Participatory financial institutions, on their part, should focus on simplifying product structures and terminology, offering pilot projects or trial-based microproducts to increase trialability, and collaborating closely with local leaders to build trust and increase the social visibility of Islamic finance tools.

6.2. Research Limitations

This research is subject to certain limitations. Its geographic focus on the Marrakech-Safi region may limit the generalizability of findings to other regions with different socioeconomic contexts. Furthermore, the study measures the intention to adopt Islamic financial services rather than actual adoption behavior. The data are cross-sectional and self-reported, which may introduce biases related to respondent subjectivity.

6.3. Future Research Directions

Future research should explore longitudinal adoption patterns to better understand how intentions translate into actual behavior over time. Comparative studies across multiple regions or countries would also be valuable for assessing the influence of cultural and institutional factors. Additionally, integrating other theoretical frameworks—such as the unified theory of acceptance and use of technology (UTAUT) or behavioral economics—and testing hybrid models combining diffusion of innovation (DOI) with the theory of planned behavior (TPB) or trust-based approaches could enrich the analysis. Employing mixed-methods research that combines quantitative trends with qualitative insights from both adopters and nonadopters would further our understanding. Addressing these avenues will help advance the ethical inclusion of Islamic finance within rural, Muslim-majority contexts.

Ethical considerations

The ethical considerations of the study included the following: participant consent: participants were thoroughly informed about the study's objectives, the interview process, and how the collected data would be used. Their agreement to participate was documented through a signed informed consent form. Voluntary participation: Participation was entirely voluntary, with participants having the right to skip any questions or withdraw from the interview or survey at any time without any consequences. Anonymity and confidentiality: Participants' identities and personal information were kept strictly confidential, with no names or identifying details disclosed.

Conflict of interest

The authors declare no conflicts of interest.

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