

Blockchain technology readiness in the financial services industry in Tanzania: Perceptions from stakeholders

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ABSTRACT

This research examines the determinants of stakeholders' intention to adopt blockchain technology in Tanzania's financial services industry. Based on a theoretical framework that includes Technology-Organization-Environment [TOE] and Diffusion of Innovation [DOI] theories, the study uses binary logistic regression to analyze the independent variables of adoption, alongside descriptive statistics. This study employed a descriptive quantitative survey approach, combining the use of a descriptive design to collect perceptions about blockchain technology, and an inferential design to analyze perceptions and identify the predictors of adoption intention based on perceptions and demographics and institutions. The current study utilized online survey with non-probability sampling method. The sample of 135 respondents was drawn from stakeholders in Tanzania. Binary logistic regression models the probability of adoption or intention of blockchain technology based on demographics, perception of the participants, technology-related factors and institutional factors. The significant determinants of blockchain technology adoption were found in positive outlook about the future (OR = 3.875, $p = .010$) and experience of taking part in training (OR = 2.830, $p = .010$), while the benefit was found to be a marginally significant determinant of adoption (OR = 2.659, $p = .064$). The predictive model predicts correctly 71.1% of all cases (AUC = 0.757) and fits the data reasonably well (Hosmer-Lemeshow $p = .061$). The descriptive analysis shows high degree of stakeholders' awareness (84.4%) but low level of expertise (5.2% of advanced level), while 63.7% of the respondents did not adopt blockchain technology in their organization. Problems with infrastructure were the major barriers to blockchain adoption (28.5%), followed by the lack of expertise (23.8%) and regulatory uncertainty (17.8%). Thus, the findings indicate that optimism and training affect blockchain adoption more than demographics and infrastructure problems. Therefore, policy intervention efforts should be focused on training and fostering realistic optimism through sandbox experiments. The current research offers the logistic regression contribution to the literature on blockchain adoption in Sub-Saharan Africa. Based on these findings, the research recommends that the financial organizations pay attention to training of employees and piloting use cases of blockchain technology with the help of the Fintech Regulatory Sandbox of Bank of Tanzania; regulators focus on promoting sandbox and structured training programs; educational institutions incorporate blockchain curriculum in finance, IT and business courses.

Keywords: Blockchain Technology, Financial Services, Sub-Saharan Africa, Technology Adoption, Tanzania

I. INTRODUCTION

Mobile money services have transformed the access to financial services in Sub-Saharan Africa. However, there is still a number of challenges associated with issues such as fraud, information exchange between companies, and insufficient identity verification procedures (Mwogosi et al., 2026). Blockchain technology can be defined as a decentralized immutable distributed ledger that provides trustless verification, transparency in record keeping and automation of compliance procedures with the help of smart contracts (Rahman et al., 2024; Dong et al., 2023). In Tanzania, the basis for innovation in fintech has been created due to the Fintech Regulatory Sandbox and National Financial Inclusion Framework 2023-2028 launched by Bank of Tanzania (Bank of Tanzania, 2024; National Council for Financial Inclusion, 2023).

Blockchain is widely piloted in financial institutions and public organizations to reduce fraud, lower transaction costs and improve auditability, payment systems, digital identity and smart contracts are among the most mature use cases already implemented (Renduchintala et al., 2022). A systematic review of the literature in the field of financial services reveals that organizational readiness and regulatory clarity, not the technology itself, determine the implementation of these use cases (Ali et al., 2020). In general, in the public sector, blockchain has been used to improve accountability and reduce corruption in institutional record keeping (Bustamante et al., 2022), which is an advantage of blockchain technology especially relevant to the developing countries where institutional trust and identity infrastructure may be insufficient (Kshetri & Voas, 2018). Tanzania serves as an example of this potential of blockchain technology:

blockchain-based vehicle inspection system piloted by the National Institute of Transport has provided a 30% reduction in inspection cycle time and annual savings and reduced records tampering opportunities (Kombe et al., 2025).

Nevertheless, despite all the efforts put into creating such an environment, no action has been taken because of the awareness of the stakeholders. The previous literature concerning the implementation of the blockchain technology in the developing countries has mostly been descriptive. It has identified the problems of a lack of awareness, infrastructure and regulatory uncertainties as the barriers to the implementation of the technology without distinction of the determinants of the independent variables (Akram et al., 2020; Mavilia & Pisani, 2020; Miah et al., 2023). However, the descriptive statistics is not enough to demonstrate the connection between the determinants and the probability of implementation. Binary logistic regression enables the estimation of the probability of the occurrence of a binary dependent variable under the influence of multiple independent variables (Peng et al., 2002; Hosmer et al., 2013). It will be especially useful in conducting research on the adoption of the technology in the developing countries as it can accept different types of predictors and does not require normally distributed residuals. In particular, as for the research on Tanzania, there is a lack of literature on the blockchain technology that is still mostly descriptive. Nkwabi (2021) considers awareness, infrastructure, regulatory frameworks and technical knowledge as barriers to the implementation of the technology, and the study does not conduct any statistical analysis of the effects of the determinants separately. On the other hand, Assenga and Makatha (2025) use inferential techniques, but they do it in relation to the cryptocurrency practitioners only. Consequently, there is almost nothing known about the technological, organizational and perceptual determinants that independently affect the intention of blockchain technology adoption in the financial services sector in Tanzania and these aspects have to be considered altogether. This is done in the present research.

The purpose of the research based on the integrated theoretical framework including the Technology-Organization-Environment (TOE) framework (Tornatzky & Fleischer, 1990) and the Diffusion of Innovation (DOI) theory (Rogers, 2003) is the assessment of factors that affect the intention of the stakeholders to adopt blockchain technology in the financial services sector in Tanzania using binary logistic regression in order to analyze technological, organizational and perceptual determinants of adoption. The specific objectives of the research that operationalize the general purpose of the study and the corresponding research questions are provided in Section 1.1.

1.1 Research Objectives

The specific objectives of the current research that correspond to the above-mentioned general objective and the TOE-DOI theoretical framework include:

- (i) Assessment of the awareness and understanding of blockchain technology among the stakeholders in the financial services sector in Tanzania.
- (ii) Analysis of the perceived benefits and barriers to the implementation of blockchain technology in Tanzania.
- (iii) In order to determine demographic, technological and perceptual variables predicting the adoption decision of stakeholders
- (iv) In order to develop evidence-based policy recommendations regarding accelerating blockchain adoption in financial services of Tanzania

II. LITERATURE REVIEW

2.1 Theoretical Review

The phenomenon of technology adoption in an organizational setting can be considered in the terms of the interrelationship between organizational competencies, external environment and individual perceptions. In the context of analyzing the issue of blockchain readiness of the financial sector in Tanzania, this approach emerges from the integration of the Theory of Technology-Organization-Environment (TOE) (Tornatzky & Fleischer, 1990) and the Diffusion of Innovations (DOI) theory (Rogers, 2003). According to the TOE framework, the process of technology adoption in an organization depends on three contextual areas: (i) the technology context, including the availability, compatibility and relative advantages of the innovation; (ii) organizational context, involving firm size, management support and human resource readiness; and (iii) the environmental context, consisting of the regulatory structures, competition and institutional norms (Tornatzky & Fleischer, 1990). The TOE framework has been utilized in the field of information systems research in both developed and emerging markets thanks to its flexible nature, which allows incorporating industry- and country-specific factors (Ali et al., 2020; Wong et al., 2020).

DOI theory helps to understand the adoption process in terms of individual stakeholder perceptions. There are five characteristics of innovation proposed by Rogers (2003), which affect the adoption decision: relative advantage, compatibility, complexity, trialability and observability. Relative advantage of blockchain refers to its higher level of security, efficiency and transparency, as well as compatibility with the existing financial infrastructure. Trialability is provided through the use of regulatory sandboxes (Bustamante et al., 2022). The combination of TOE and DOI theories in the scope of the current study appears to be particularly suitable due to the possibility of taking into account by TOE theory factors related to organizational and institutional context (technology readiness, regulatory climate and

infrastructure), and DOI theory provides the understanding of underlying processes of adoption (attitudes, perceived benefits and training effects). Thus, binary logistic regression is used to analyze the effect of each TOE-DOI integration dimension on the adoption dependent variable independently.

2.1.1 Blockchain Technology and Financial Services

According to Dong et al. (2023), blockchain is a decentralized, tamper-proof distributed ledger of transactions, which is maintained by a peer-to-peer network. As a technology that is cryptographically secure and based on the idea of consensus, blockchain is highly applicable in performing trusted transactions between parties (Tiwari et al., 2025). There are four kinds of blockchains: public, private, consortium, and hybrid. The private and consortium blockchains are recommended for use in regulated financial services, offering the best compromise between access control and transparency (Abdelhamid et al., 2024). The most common advantages of blockchain technology in financial services include fraud detection, inexpensive cross-border payments, automated regulatory reporting and digital identity verification (Renduchintala et al., 2022). They can address such issues of financial infrastructure of developing countries as inadequate documentation, costly reconciliation, and lack of auditability (Mavilia & Pisani, 2020).

2.2 Empirical Review

A considerable amount of empirical research on the adoption of blockchain technology in financial services has been carried out in recent years. This section provides an overview of the research in line with the four specific objectives outlined in Section 1.1: awareness and understanding (Section 2.2.1), perceived benefits and barriers (Section 2.2.2), determinants of adoption (Section 2.2.3), and policy and regulatory levers (Section 2.2.4).

2.2.1 Awareness and Understanding of Blockchain Technology

While the research into the blockchain adoption and usage in Tanzania is still at its early stages, there are studies specifically focused on the awareness and understanding of blockchain technology in the country. In a narrative review of factors driving the adoption and usage of blockchain technology in Tanzania, Nkwabi (2021) concludes that the most important factors driving the process are awareness, infrastructure, regulation, and technical know-how. While Nkwabi's (2021) review identifies the most relevant factors behind the awareness and usage of blockchain, it does not apply inferential statistics to quantify the independent influence of the factors nor distinguish between individual and organizational levels of awareness. Mwogosi et al. (2026) investigated stakeholders' perceptions of blockchain and artificial intelligence in the context of electronic health records in Tanzania. The authors find that, despite overall positive attitudes towards the technologies, numerous barriers remain as a result of lack of infrastructure, concerns regarding cost-effectiveness, and data privacy issues. While the study by Mwogosi et al. (2026) is sector-specific to healthcare and uses a descriptive methodology, the present study expands the research scope to include the financial services industry and quantify the levels of awareness and understanding across a wider range of stakeholders.

Overall, this literature establishes high levels of awareness combined with low levels of technical understanding of blockchain in developing country settings (Nkwabi, 2021; Mwogosi et al., 2026), but stops short of estimating the levels with a dedicated, sector-specific sample of financial services stakeholders in Tanzania – a gap that Objective i of the present study aims to address.

2.2.2 Perceived Benefits and Barriers to Blockchain Implementation

In terms of the general landscape of the topic, at the international level Ali et al. (2020) conduct a systematic literature review of 87 peer-reviewed publications on blockchain in the financial sector, concluding that, while the technical capabilities of blockchain have been studied extensively, organizational readiness and regulatory frameworks remain the key barriers to the realization of the benefits. However, this study is biased geographically, with more than 90% of the analyzed publications coming from the developed economies and only 12% from Sub-Saharan Africa. Chang et al. (2020) use a qualitative approach (interviews with sixteen fintech and banking experts) and the Theory of Planned Behavior to identify knowledge hiding as a behavioral barrier to blockchain adoption in the industry. This study is methodologically sound, but contextually limited, as the barrier may manifest differently in Tanzania, where the information asymmetry can be caused not so much by competitive behavior, as by a lack of infrastructure. In a comprehensive review of blockchain applications in the financial services industry, Miah et al. (2023) identify the regulatory uncertainty and interoperability as universal barriers to adoption; however, empirical evidence on the adoption of blockchain in East Africa is missing. Renduchintala et al. (2022) perform a bibliometric and content analysis of 185 blockchain applications in the FinTech sector, finding that the payment systems, digital identity, and smart contracts are currently the most mature realizations of blockchain and enabling of its benefits. These findings are consistent with the use cases described by the Tanzanian adopters of blockchain in the present study (payment systems, record keeping, and identity verification).

Literature that is specific to Sub-Saharan Africa is relatively scarce. Mavilia and Pisani (2020) analyze the potential of blockchain to support financial inclusion in Africa with the help of Global Findex 2017 data and find

inadequate documentation, expensive transactions, and interoperability to be the systemic barriers that blockchain could help resolve. However, this study is based on secondary data and does not investigate the factors of individual or organizational adoption of blockchain, which are the focus of the present study. Kshetri and Voas (2018) explore the implementation of blockchain in developing countries and conclude that the institutional void, unreliable identity systems, weak contract enforcement mechanisms, and thin credit histories make up barriers to, and opportunities for, blockchain adoption – a conceptual contribution that is augmented by the inferential findings from a single country in the present study. From the perspective of the public sector governance, blockchain is used in developing countries to enhance accountability and reduce corruption in institutional record-keeping (Bustamante et al., 2022).

Together, the above literature identifies infrastructure, cost, regulatory uncertainty, and knowledge-hiding as the benefits most commonly mentioned globally, and fraud detection, efficiency, and record-keeping as the barriers most commonly mentioned (Chang et al., 2020; Mavilia & Pisani, 2020). However, all of it does not provide empirical estimates of the benefits and barriers that financial services sector stakeholders in Tanzania specifically perceive, the gap that the present study aims to fill through Objective ii.

2.2.3 Determinants of Blockchain Adoption Intention

Queiroz et al. (2021) conducted a comparative cross-national study that looked at blockchain adoption in operations and supply chain management in Brazil, an emerging economy with institutional infrastructure similar to Tanzania's one. They found that trust and expected benefits significantly predicted adoption intention, while regulatory support did not, a pattern that is confirmed by the findings of the present study, discussed in Section 4.5, regarding Tanzania's financial services sector. In a systematic review and meta-analysis of 47 empirical studies, Hornuf et al. (2025) identified determinants of mobile fintech adoption in Sub-Saharan Africa, concluding that perceived ease of use and perceived usefulness are the most important; although their meta-analysis focuses specifically on mobile money and mobile banking rather than blockchain, Hornuf et al.'s (2025) identification of digital and financial literacy as important moderators proves the relevance of training as a determinant in the present study. By studying the Nigerian banking industry in a longitudinal design, Sule (2026) discovered that organizational determinants such as size, profitability, and age were significant, thus confirming the importance of the organizational dimension of the TOE framework; by contrast, the present study shows that in the financial services sector of Tanzania, demographic and organizational determinants become statistically insignificant when psychological and experience-based factors are taken into account. In a study that utilized Technology Acceptance Model, Assenga and Makatha (2025) studied cryptocurrency adoption among practitioners in Dar es Salaam and found that perceived usefulness was significantly and positively associated with adoption intention ($\beta = 0.526$, $p = .001$), while perceived ease of use and perceived risk had no effect. Nevertheless, this study is restricted to cryptocurrency practitioners and does not look at the perception of organizational and regulatory determinants jointly with perceptual ones.

The above literature offers few studies that look at organizational, technological, and regulatory determinants of blockchain adoption jointly with inferential statistics, an analysis that is specific to East African context (Kshetri & Voas, 2018; Hornuf et al., 2025; Assenga & Makatha, 2025). The particular gap is addressed in the present study under Objective iii through binary logistic regression analysis of sixteen predictors encompassing the technological, organizational, and perceptual dimensions of the integrated TOE-DOI framework.

2.2.4 Policy and Regulatory Levers for Blockchain Adoption

Regulatory policies define the environment in which blockchain adoption takes place in Tanzania. The Bank of Tanzania's Fintech Regulatory Sandbox creates a controlled environment for testing fintech products that do not meet existing regulatory requirements (Bank of Tanzania, 2024). The National Financial Inclusion Framework 2023-2028 includes financial inclusion goals and stresses the role of digital literacy, digital infrastructure development, and public-private cooperation (National Council for Financial Inclusion [NCFI], 2023). At the same time, the Bank of Tanzania has warned the public of the risks posed by unregulated virtual-asset trading (Bank of Tanzania, 2019). More broadly, governance, sandboxing, and interdepartmental coordination have been key drivers of blockchain adoption in the public sector (Bustamante et al., 2022).

Although these studies advocate for training, sandboxing, and coordinated regulation as levers for accelerating adoption (Bank of Tanzania, 2024; Bustamante et al., 2022), none of them offer quantitative evidence from the financial services sector of Tanzania on which of the mentioned levers actually predict adoption intention of stakeholders, and none of them have ever studied how financial services stakeholders perceive those particular regulatory instruments. The gap is filled by Objective iv of the present study through introduction of regulatory familiarity and perceived government proactivity as predictors in the context of the TOE framework, and through evidence-based policy recommendations provided in Section 5.2.

From this review of the literature, it is clear that research on the use of blockchain in Tanzania has largely been either descriptive, sector-specific or conceptual in nature. Moreover, no study so far has investigated the role of both technological, organizational, and perceptual variables on the adoption intention of blockchain technology amongst

financial service providers through inferential statistics. Therefore, this literature review helps identify a specific gap in the existing literature that this research is aimed at filling. Namely, the research attempts to conduct an inferential, TOE-DOI framework based investigation of the factors determining the adoption intention of blockchain technology amongst financial service providers in Tanzania.

III. METHODOLOGY

3.1 Research Design

This study employed a descriptive quantitative survey approach, combining the use of a descriptive design to collect perceptions about blockchain technology, and an inferential design to analyze perceptions and identify the predictors of adoption intention based on perceptions and demographics and institutions. Both designs have been developed according to the integrated TOE-DOI theoretical framework that posits that adoption intention is influenced by technology readiness (technological context), training and organizational capacity (organizational context) and regulatory and perceptual factors (environmental context).

3.2 Study Area

The research took place in Tanzania, with special emphasis being put on Dar es Salaam. Special attention was given to the city of Dar es Salaam because it is considered to be the main economic and financial center of the country, housing the headquarters of most of the banks, fintech companies and financial regulatory agencies and hence stakeholders that are actively involved in financial technology innovation. However, the study also covered participants from other regions of Tanzania to obtain a broader overview of stakeholders' perceptions.

3.3 Target Population

The target population consisted of people with professional experience in the field of financial services, digital finance, ICT and regulation or technology adoption in Tanzania. This population was made up of senior managers, IT specialists, regulators, and other stakeholders who had access to and/or influence over blockchain technology related decisions in their organizations (Saunders et al., 2023).

3.4 Sampling and Sample Size

Purposive non-probability sampling was employed to identify potential participants within this target population on the grounds that stakeholders that have experience in financial technology, regulation and innovation would be in a better position to provide valuable responses on blockchain awareness and perceptions. In total, 135 valid responses were collected and will be used in this study ($n = 135$). Despite the fact that this sampling method is applicable to the specialized population, it prevents the study from achieving high levels of generalizability.

3.5 Data Collection and Measurement

An online self-administrated survey was conducted to collect data from respondents. Data collected included demographic variables, knowledge and understanding of blockchain technology, benefits, adoption status and barriers, need for capacity building, infrastructure, economic and cultural considerations, and regulation perception.

Adoption Intention, which is the dependent variable in the study, was measured by one item that asked whether the respondent organization had adopted blockchain technology or was planning to adopt blockchain technology in the future (1 = Yes, 0 = No). Sixteen independent variables were used in the regression analysis. Variables in this regression analysis were categorized as follows according to the TOE-DOI framework: Demographic Variables (gender, educational qualification (Post graduate/bachelor's and below), age (less than or equal to 35 years old, more than 35 years old), and region of residing (Dar es Salaam and other regions)); Technology Readiness Variables (exposure to other technologies, level of understanding (no understanding, some understanding, good understanding, and advanced understanding), adequacy of infrastructure, training attendance, importance of capacity building, and understanding of regulation); Perceptions and Environment Variables (Positive perception of the role of blockchain technology to improve the sector, potential of blockchain technology in the future, regulator's support, proactive attitude of the government, adequacy of personal knowledge of blockchain and public acceptance). All predictors except level of understanding are binary indicators (1 = Yes, 0 = No).

3.6 Analytical Strategy

Descriptive statistics were conducted for all the variables. Binary logistic regression analysis was conducted using the Statsmodels package in Python programming language. Six models were fitted for analysis: (1) Full model with all sixteen predictors; (2) Reduced model with the predictors that have the highest strength in each of the domains; (3) Technology Readiness Domain Model; (4) Perceptions and Environment Domain Model; (5) Demographics Only Model; (6) Optimal Model with Unique Predictors. Likelihood Ratio Test, AIC (Akaike Information Criterion), pseudo

R^2 , Nagelkerke R^2 , and Hosmer-Lemeshow Test were applied in testing the goodness of fit of each of the six models. Performance measures used for prediction included ROC AUC and classification accuracy. VIF (Variance Inflation Factors) were used to screen the collinearity among the predictors before fitting the models.

3.7 Ethical Considerations

The study was conducted ethically. Participation was voluntary: potential respondents were informed about the aim of the study, the voluntary nature of participation, and their right to withdraw at any time without penalty; thus, they implicitly gave informed consent before completing the online questionnaire. No identifiable data including name, email address, and organizations were requested; the whole process was anonymous and confidential, and the data collected were safely stored and only used for the purpose of this research. No financial or other incentives were provided to respondents, reducing the risk of response bias.

IV. FINDINGS & DISCUSSION

In line with the objectives of this study (Section 1.1), the results are presented as follows: awareness and understanding (Section 4.2, Objective i), benefits, barriers, and adoption status (Section 4.3, Objective ii), and the determinants of adoption intention (Section 4.4, Objective iii). Objective iv the policy recommendations based on evidence are presented in Section 5.2.

4.1 Sample Profile

The demographic features of the 135 respondents are shown in Table 1. The age of the respondents was relatively young, and males dominated. The age groups of 21-25 years (23.0%), 36-40 years (20.7%), and 31-35 years (20.0%) were predominant. Male respondents represented 69.6% of the entire sample size while female respondents accounted for 30.4%. Education levels were relatively high, with 55.6% having completed their bachelor's degree and 37.8% having a postgraduate degree. Over half of the respondents (53.3%) lived in Dar es Salaam.

Table 1

Demographic Features of Respondents (n = 135)

Category	Sub-category	Frequency	Percentage (%)
Age group	21–25	31	23.0
	26–30	19	14.1
	31–35	27	20.0
	36–40	28	20.7
	41–45	17	12.6
	46 and above	13	9.6
Gender	Male	94	69.6
	Female	41	30.4
Education	Bachelor's degree	75	55.6
	Postgraduate	51	37.8
	Diploma / certificate / secondary	9	6.6
Region	Dar es Salaam	72	53.3
	Other regions (combined)	63	46.7

4.2 Awareness and Understanding of Blockchain Technology

Awareness about blockchain was relatively high, with 84.4% of the respondents indicating they had knowledge of blockchain before the survey, and the internet served as the main source of awareness (75.4% among those aware). However, the understanding of the respondents regarding blockchain remained shallow, since 62.2% indicated that they had basic understanding of it, 16.3% had no understanding, 16.3% had a good understanding, and only 5.2% had an advanced understanding. This is shown in Table 2 below.

Table 2*Awareness and Understanding of Blockchain Technology (n = 135)*

Category	Sub-category	Frequency	Percentage (%)
Awareness before survey	Aware	114	84.4
	Not aware	21	15.6
Source of awareness (aware respondents)	Internet	86	75.4
	Other sources	28	24.6
Level of understanding	No understanding	22	16.3
	Basic understanding	84	62.2
	Good understanding	22	16.3
	Advanced understanding	7	5.2

Note. Frequencies were derived from the percentage of the entire sample size ($n = 135$), as in Table 1. Source of awareness frequencies were obtained among the 114 aware respondents.

4.3 Perceived Benefits, Barriers, and Adoption Status

However, perceptions regarding blockchain technology were relatively positive, with 69.6% of the respondents saying that blockchain could play an important role in developing the financial sector in the country. Most expected benefits include enhanced security (27.9%), efficiency (27.5%), transparency (25.9%), and cost savings (18.7%), as illustrated in Table 3 below.

Table 3*Perceived Benefits of Blockchain Technology Adoption (n = 135)*

Perceived benefit	Frequency	Percentage (%)
Increased security	38	27.9
Increased efficiency	37	27.5
Increased transparency	35	25.9
Cost reduction	25	18.7

Although the general perception of blockchain technology was positive, the level of organizational adoption remained relatively low, since 63.7% of respondents said that their organizations had not adopted blockchain technology yet, and only 36.3% had done so or were considering adopting blockchain technology, as shown in Table 4 below.

Table 4*Organizational Adoption Status and Use Cases (n = 135)*

Category	Frequency	Percentage (%)
Adopted or thinking about adopting	49	36.3
Not implemented	86	63.7
Use Case: Payments / Transaction Processing	36	26.7
Use case: Record keeping	26	19.3
Use case: Supply chain management	21	15.6
Use case: Identity verification	18	13.3

Note. Use-case percentages do not add up to 100%, as respondents could have selected multiple use cases for their organizations.

In organizations that had not adopted blockchain, the main obstacles pointed out by respondents were a lack of skilled personnel (27.1%), technical difficulties (26.1%), regulatory environment concerns (16.9%), finances (16.6%), and resistance to change (12.9%). Only 38.6% thought that the current infrastructure is sufficient, and 42.2% were neutral about this issue. There was low awareness of the regulatory environment; 55.6% of respondents had neutral positions regarding regulatory support. Capacity-building was deemed important, with 81.5% indicating its extreme or high importance. However, 41.5% stated that they did not receive any training. Table 5 presents the barriers and capacity-building needs indicated by respondents.

Table 5*Barriers to Adoption, Infrastructure, and Capacity-Building Needs (n = 135)*

Category	Sub-category	Frequency	Percentage (%)
Barriers among non-adopters	Lack of qualified staff	37	27.1
	Technical issues	35	26.1
	Regulatory environment concerns	23	16.9
	Financial constraints	22	16.6
	Resistance to change	17	12.9
Infrastructure adequacy	Adequate	52	38.6
	Neutral	57	42.2
Regulatory support perception	Neutral	75	55.6
Capacity building	Extremely / very important	110	81.5
	Not yet trained	56	41.5

4.4 Determinants of Blockchain Adoption Intention

4.4.1 Multicollinearity and Model Specification

The Variance Inflation Factors (VIFs) were computed for all sixteen predictors. The highest value of VIF is 9.67 (prior exposure), which is less than the typical cutoff of 10. Thus, all theoretically important predictors were included in the final model.

4.4.2 Model Comparison

Table 6 includes the comparison of six logistic regression models. The model with all sixteen predictors showed the highest pseudo R^2 (0.245) and Nagelkerke R^2 (0.335) but the significance of just one predictor -- future outlook ($p = .022$). This result confirms the existence of the problem of overfitting caused by the relatively small sample size. The demographic variables-only model performed poorly (Nagelkerke $R^2 = 0.085$) and did not detect any significant predictors. Hence, adoption intention could not be explained by demographic variables. The technology-readiness model revealed participation in training ($p = .050$) as a significant predictor. The perception and environment model indicated a marginal significance of belief in improvement ($p = .070$). The model with only the most influential predictors from each domain turned out to be significant in predicting future outlook ($p = .009$) and participation in training ($p = .015$) and showed a good balance between parsimony and goodness-of-fit (AIC = 158.45). Finally, the optimal model included the predictors which had been detected as significant individually: future outlook, training, and belief in improvement. Table 7 shows the results of this optimal model.

Table 6*Comparison of Binary Logistic Regression Models*

Model	Predictors	Pseudo R^2	Nagelkerke R^2	AIC	Significant Predictors ($p < .05$)
Model 1: Full	16	0.245	0.335	167.62	Future outlook
Model 2: Reduced	5	0.161	0.220	158.45	Future outlook, Training
Model 3: Technology readiness	6	0.115	0.157	168.60	Training
Model 4: Perception and environment	6	0.138	0.189	164.48	Belief improves ($p = .070$)
Model 5: Demographics	4	0.062	0.085	173.86	Education ($p = .085$)
Model 6: Optimal	3	0.148	0.203	158.71	Future outlook, Training

4.4.3 Optimal Model Results

As a result, the final model turned out to be statistically significant (likelihood ratio $\chi^2 = 26.17$, $df = 3$, $p < .001$) and fitted the data quite well (Hosmer-Lemeshow $\chi^2 = 5.59$, $df = 2$, $p = .061$). This model predicted 71.1% of cases (ROC AUC = 0.757) and, thus, surpassed the acceptable threshold of 0.70 (Hosmer et al., 2013). The future outlook seemed to be the strongest predictor: the participants who held positive outlook about the development of blockchain in Tanzania turned out to be almost four times more likely to use it (OR = 3.875, 95% CI [1.377, 10.904], $p = .010$), even when adjusted for training and belief in improvement. The second independent significant predictor was the training participation: the trained respondents proved to be 2.83 times more likely to adopt blockchain (OR = 2.830, 95% CI [1.288, 6.217], $p = .010$). Participation in training seems to add to the technology adoption beyond raising awareness, perhaps, owing to the enhanced confidence and networking. The belief in improvement also turned out to be the significant predictor (OR = 2.659, 95% CI [0.944, 7.492], $p = .064$): the lower boundary of the confidence interval approached 1.0, and so, an additional increase in the sample size would validate its full significance. Of course, the other thirteen predictors failed to be significant in the presence of the future outlook, training participation, and the belief in improvement. However, this result does not mean the lack of influence of the other predictors on the adoption of

technology; instead, the influence of these predictors may be mediated by the future outlook, training participation, and belief in improvement.

Table 7

Binary Logistic Regression Results Optimal Model (n = 135)

Predictor	B (SE)	Wald z	P	OR	95% CI	Interpretation
Constant	-2.805 (0.612)	-4.582	< .001	0.061	[0.018, 0.201]	Baseline log-odds
Future outlook	1.355 (0.528)	2.565	.010	3.875	[1.377, 10.904]	Positive outlook → 3.9× odds
Training	1.040 (0.402)	2.591	.010	2.830	[1.288, 6.217]	Training → 2.8× odds
Belief improves sector	0.978 (0.528)	1.851	.064	2.659	[0.944, 7.492]	Marginal (p < .10)

Note. Model fit: Likelihood ratio $\chi^2(3) = 26.17$, $p < .001$; Nagelkerke $R^2 = 0.203$; ROC AUC = 0.757; Hosmer-Lemeshow $\chi^2(2) = 5.59$, $p = .061$; classification accuracy = 71.1% (sensitivity = 47.0%, specificity = 84.9%).

4.5 Discussion

In this regard, the descriptive findings concur with those reported by Nkwabi (2021) and Mwogosi et al. (2026) for Tanzania – namely, high awareness, low expertise and adoption, and numerous infrastructural, regulatory, technological, and social barriers – and, in addition to describing the blockchain readiness, provide inferential evidence about which barriers survive the statistical control when training and attitudinal factors are considered. The regression analysis helps differentiate between the direct barriers and those barriers that impact the decision-making process indirectly. Even though the positive future outlook and participation in training turn out to be the independent significant predictors, the infrastructural and regulatory concerns, although being the most common barriers, do not generate any independent effect.

Nonetheless, the most appropriate interpretation of this result within the framework of integrated TOE and DOI models is that the infrastructure and regulations matter because they mediate through the perceptions and competencies of the stakeholder that, in the TOE terms, is an environmental and personal factor, and in the DOI terms, is a compatibility/trialability factor rather than a direct and independent barrier. This interpretation aligns with Queiroz et al.'s (2021) finding in the comparable context of supply chains in the emerging economy that trust and expected benefits but not the regulatory support predict blockchain adoption intention. The present research extends this result to the financial services sector in Tanzania, showing that the future outlook and training but not the regulatory familiarity are the significant independent predictors of blockchain adoption intention. An optimistic and competent stakeholder would perceive and react to the regulatory uncertainty and technological problems differently than an uninformed and incompetent one. Therefore, the future outlook, being a relative advantage in the DOI model, becomes the main predictor with the mediating role of attitudes in the effect of context. It is worth noting that the gap between the percentage of blockchain awareness (84.4%) and organizational adoption (36.3%) cannot be explained by awareness itself, since it is not sufficient to turn into action; awareness creates interest but not implementation. Optimism and training may help close this gap, and the sandbox is a perfect environment for developing them: training increases the observability and decreases complexity from the DOI viewpoint, while sandbox participation increases trialability; training enhances organizational readiness, while sandbox reduces uncertainty from the TOE perspective.

The low explanatory power of the demographics model, and the lack of demographic predictors in the optimal model, are of critical importance for the policy agenda. The adoption of blockchain technology in the financial services sector in Tanzania is not limited to any particular demographic group but rather depends on attitudinal and experience-based factors that should be easier to change through policy than demographic characteristics such as age and gender. This finding differs from that of Sule (2026), who reports that in the Nigerian banking sector, bank size, profitability, and age turn out to be significant organizational predictors of blockchain adoption. Null demographic findings of the present research suggest that, at the individual stakeholder level in the financial services sector in Tanzania, attitudinal and experience-based factors are more important than structural firm-level characteristics, which might be attributed to the difference in the unit of analysis. The only partial exception to this rule is postgraduate education, which turned out to be negatively but not significantly correlated with adoption in the demographics-only model; the possible reason is that more educated respondents tend to work in larger organizations, which are characterized by the institutional inertia.

As for the perceived regulatory challenges, these should be treated cautiously. Over 50 percent of respondents stated their neutral stance on the degree of regulatory support and government's proactive behavior, and none of the regulatory variables proved to be predictive after controlling for attitudinal and training factors. This is in line with a perception-mediation hypothesis, according to which lack of clarity in regulations itself does not impede adoption but operates via stakeholder perception. This finding is consistent with the meta-analysis result reported by Hornuf et al. (2025), who demonstrated that digital and financial literacy, but not regulatory clarity, moderates fintech adoption in Sub-Saharan Africa, supporting the idea of training as a more effective policy tool in comparison with regulatory communication. For optimistic and trained stakeholders, the sandbox environment provides a chance, while for doubtful

and untrained people, it poses a problem; if this hypothesis is true, the effect of regulation will be smaller than when combined with training and demonstration projects. As noted by Renduchintala et al. (2022) using bibliometric analysis, currently, payment systems, record keeping, and identity verification are the most mature blockchain applications worldwide, similarly to the applications adopted by blockchain adopters from this sample payments, record keeping, and supply chain management, which do not require industry-wide change but still benefit from multi-party verification. From the above regression results, it follows that the policy recommendation should be launching pilot projects in the regulatory sandbox environment for increasing training capacity and promoting positive attitudes as the main independent predictors of adoption.

V. CONCLUSION & RECOMMENDATIONS

5.1 Conclusion

Methodologically, this research has moved beyond descriptive analysis to the application of binary logistic regression in order to reveal independent factors of blockchain technology adoption in Tanzania's financial services industry. Empirically, two independent variables have been found to be significant: future outlook and participation in training programs. Benefits have turned out to be insignificant, while demographic characteristics became insignificant after controlling for attitudinal and experience-based factors. It is critically important for practice, since the most relevant factors are the ones that are controllable by policymakers and organizations. The best-performing logistic regression model has provided 71.1 percent classification accuracy and 0.757 of ROC AUC, a relatively high level of predictive power for such a parsimonious three-predictors specification. Practically, this study indicates that the current enthusiasm toward blockchain technology in Tanzania has overcome institutional readiness and could be solved by targeted training and experimentation with blockchain sandboxes, but not only via infrastructure investments. The above findings, formulated in relation to Objectives i-iii, provide the ground for evidence-based policy recommendations for Objective iv given below.

5.2 Recommendations

The following recommendations are based on the findings reported in Section IV and are structured so as to meet Objective iv of the study deriving evidence-based policy recommendations for accelerating blockchain adoption in Tanzania's financial services industry.

Recommendation 1 (in line with the strongest organizational-context predictor, Objective iii). Financial institutions are recommended to involve their employees into training programs on blockchain technology, considering that participation in training was a significant predictor of adoption ($OR = 2.830$).

Recommendation 2 (in line with the environmental-context factor, Objectives ii and iv). Pilot testing of blockchain applications in payments reconciliation, identity verification, and compliance record-keeping (the same use cases, which were reported by adopters in Section 4.3) should be carried out in the Fintech Regulatory Sandbox of the Bank of Tanzania. Regulators should actively promote participation in sandbox, while at the same time conducting training programs along with the regulatory framework. Given that regulation influences adoption mainly via stakeholder perception, rather than through compliance (see Section 4.5), training programs are recommended as a way of shaping this perception.

Recommendation 3 (to support human capital development, Objective iii). It will be very useful to include in the curricula courses that cover the basics of blockchain technologies. Since the training variable is one of the two most important independent predictors of adoption, the investments in human capital development can bring more adoption benefits than those in infrastructure alone.

Recommendation 4 (to support a training-sandbox package, Objective iv). The combination of training and sandbox adoption, which correspond to the organizational and the environmental context factors of the TOE framework, respectively, may have a synergy effect, which cannot be confirmed because of the cross-sectional nature of the current study. Therefore, governments and development partners should think about financing both training and pilot projects.

Recommendation 5 (future research objective iii). Academic researchers are encouraged to use the structural equation modeling technique to test the hypothesis of perception mediation and conduct the longitudinal study of sandbox adopters to see whether training occurs before adoption temporally.

Declaration of Interest

The authors declare that they do not have any known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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