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PAPER

The Impact of AI-Powered Mobile Money System on Supply Chain: Multi-Cases from SMEs in the Global South

Mostafa Mohamad[1] (✉), Michael Nii Laryeafio[2], Ebimoboere Koroye[2], Derick Nyame[3], Samuel Ayertey[2], Adelina Emini[4]

[1]Zayed University, Abu Dhabi, UAE

[2]Arden University, London, UK

[3]University of Wolverhampton, Wolverhampton, UK

[4]University of Prishtina, Pristina, Kosovo

mostafa.mohamad@zu.ac.ae

ABSTRACT

This study explores the effects of adopting an artificial intelligence (AI)-powered mobile money system (AI-MMS) on supply chain operations among small and medium-sized enterprises (SMEs) in the Global South. The authors developed a new version of Rogers' Diffusion of Innovation model (DoI) that considers the geopolitical context and environmental factors, including regulatory framework, trust, risk and complexity, to help understand how AI-MMS can enhance transactional efficiency in SMEs and bridge the financial inclusion gap. Using qualitative methods, we conducted 40 semi-structured interviews with SME owners in Abuja, Lagos, Kaduna, Kano and Port Harcourt and found that AI-MMS enhanced their logistics knowledge, increased system trust and helped overcome fraud along their supply chains. We also found that new economic forces have emerged because of the successful diffusion of AI-MMS in Nigeria. Our study contributes to the emerging debate on how AI-human intelligence in mobile technologies reshapes the economy and geopolitical context in developing nations. The paper also contributes to the practices of AI-MMS and how it enhances supply chain and logistics learning for SMEs in Nigeria and other countries with a similar geopolitical context.

KEYWORDS

artificial intelligence (AI), mobile money system (MSS), small and medium-sized enterprises (SMEs), supply chain, diffusion of innovation, sociotechnical sub-systems, digital payment ecosystem

1 INTRODUCTION

Since the emergence of M-Pesa in Kenya in 2007, the use of mobile money systems (MMS) has gained considerable momentum across developing economies and southern territories (i.e., the Global South), offering an alternative financial inclusion

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tool to populations historically excluded from traditional banking services [1]. Developing countries, such as Tanzania, Uganda and Pakistan, have adopted MMS to revolutionise their payment systems, enabling seamless financial transactions for individuals and businesses alike [2]. MMS fostered new pathways for financial inclusion, revenue prediction, and risk forecasting, helping businesses streamline their operations and supply chains [3]. This paper presents evidence from Nigeria, Africa's largest economy by GDP and population, providing a complex case. Based on data collected from [4], we developed Figure 1, which shows the value of mobile money transfers during the last 5 years. With a high mobile phone penetration rate, MMS usage in Nigerian SMEs is not high due to infrastructural, regulatory and socio-cultural challenges [5]. Existing mobile banking (MB) facilities in Nigeria tend to rely on traditional banks rather than telecom-based systems, which are less convenient and less flexible, particularly for the unbanked. Additionally, there has been slow MMS diffusion owing to issues of fraud, inadequate network infrastructure and illiteracy [6].

Fig. 1. Value of mobile money transfers in Nigeria during the last five years [4]

Recently, MMS has been powered by AI to enhance efficiency, inclusivity and decision-making capabilities, thereby transforming supply chain management. The integration of AI with mobile applications facilitates real-time data access, enabling businesses to optimise operations and reduce costs. This synthesis highlights key aspects of AI-powered MMS within supply chains. In terms of operational efficiency, AI-powered MMS enables continuous monitoring of inventory and assets, improving visibility and responsiveness [7]. The AI algorithms are based on machine learning (ML), which facilitates demand forecasting and inventory optimisation to reduce waste, ensuring timely supply [8]. AI-powered MMS also enhanced risk management for SMEs by democratising access to finance and assessing credit history in real-time [9]. Studies such as [10, 11] provided extensive evidence on how AI-powered MMS helps identify potential financial risks by analysing historical and market data, allowing proactive management of supplier relationships.

In this study, we explored the perceived impact of MMS on the supply chain activities of Nigerian SMEs in the context of the Global South. The interpretative philosophy and qualitative methods have been adopted to conduct. In order to study this phenomenon, we employ Rogers' Diffusion of Innovation (DOI) theory (2010) [12], which is helpful to describe the process by which 40 semi-structured SMEs adopted and diffused AI-MMS. The study begins with a literature review to reveal the research gaps, then it explains the emerging theoretical framework, justifies the methodology, and presents the findings. The discussion and conclusion sections reveal the empirical and theoretical contributions. AI-based model specific to MMS, the AI-Powered MMS, AI applications in the supply chain and DOI, and is later developed further against the background of empirical evidence emerging from interviews with SME owners in Abuja and Kaduna, within a Global South (Developing) context.

2 LITERATURE REVIEW

2.1 Mobile money system and financial inclusion in the Global South

Mobile money systems enables financial transactions, such as transfers, payments, savings, and credit, via mobile devices, serving both banked and unbanked populations [13]. From its early implementation in Kenya with M-Pesa, MMS has emerged as a driver of financial inclusion in regions with weak banking infrastructures. According to [14], MMS overcomes barriers for financial accessibility for untapped communities in the global south, leading to improved security, financial liquidity, and business performance.

Mobile money systems is found to lead to financial innovation and capacity building for SMEs in Africa's slums [15]. So, it could support small and informal supply chains among Nigerian SMEs by reducing transaction delays and increasing accountability. Despite Nigeria's high mobile phone penetration (over 90%), MM adoption lags notably behind East African peers [16, 17]. Two critical issues are trust and confusion between MMS and MB. [18] revealed that SMEs are conflating MMS with bank apps and expressing anxiety due to past fraud, as well as legacy cases like TV Mobile, which fuels scepticism. While adopting MMS, SMEs in the global south still face issues of trust and perceived risk. The complexity of regulatory frameworks delayed the diffusion of MMS, necessitating the enhancement of system intelligence and analytics through AI, which in turn enabled authorised authentication for regulators and various stakeholder groups [19]. Nigeria's bank-led architecture restricts telecoms from rolling out MMS independently, unlike Kenya. This limits system flexibility, increases costs, and hampers outreach. The emerging challenges analysis highlights that integrity, privacy, and infrastructure remain primary obstacles to financial inclusion via MMS [20].

2.2 AI and machine learning: The next frontier of MMS

Recent research identifies the intersection of MMS and AI/ML as revolutionary. [21] established M-PESA adoption patterns using mobile phone metadata with an AUC of 0.69, denoting predictive analytics that can be used to inform interventions. Similarly, [22] Khan and Blumenstock (2016) determined ML-based adoption models were context-specific, highlighting Nigeria's need for locally created models. [23] addressed how to utilise machine learning and interpretable AI to counteract

the urgent case of fraud in the new digital banking reality, particularly relying on SHapley Additive exPlanations (SHAP). To improve prediction and interpretability, this work utilises a dataset of 6,362,620 records artificially generated from the PaySim simulator. [24] confirms that the applications of AI in contactless payment platforms such as MMS will enhance security and fraud detection in the Global South. Figure 2 plots three metrics of synthesised estimates for 2021–2025: mobile broadband subscriptions per 100 individuals, penetration of AI (as a percentage of firms using AI), and AI investments in USD millions. The investments and subscriptions have been normalised for comparative plotting purposes. The figures are estimated based on publicly available data; verify with primary data for informed decision-making. This plot was designed by the authors based on data from the ITU/World Bank (subscriptions), country reports/PwC Nigeria (adoption of AI), industry reports/Tracxn (investments), and the Brookings/Africa AI reports (environmental and SME impact).

AI-MMS incorporates AI into fraud protection, customer segmentation, credit scoring, and chatbots [25]. [26] sees how AI-based credit scoring, facilitated by digital trails, is reshaping financial models, just as MMS unlocked economic empowerment in the past. There are successful cases of AI-MMS in Nigeria, such as Yabx and PayCliq, which are widely used for micro-lending and SMEs through mobile channels [27]. These developments of AI-MMS have a wide range of applications, including financial compliance, fraud detection, and supply chain finance. AI-MMS systems are capable of managing liquidity, detecting anomalies, and assessing credit risk in real-time. The next section explores these possibilities, noting how slippage or untrustworthiness could be anticipated through warning forecasts, an avenue available to AI implementation.

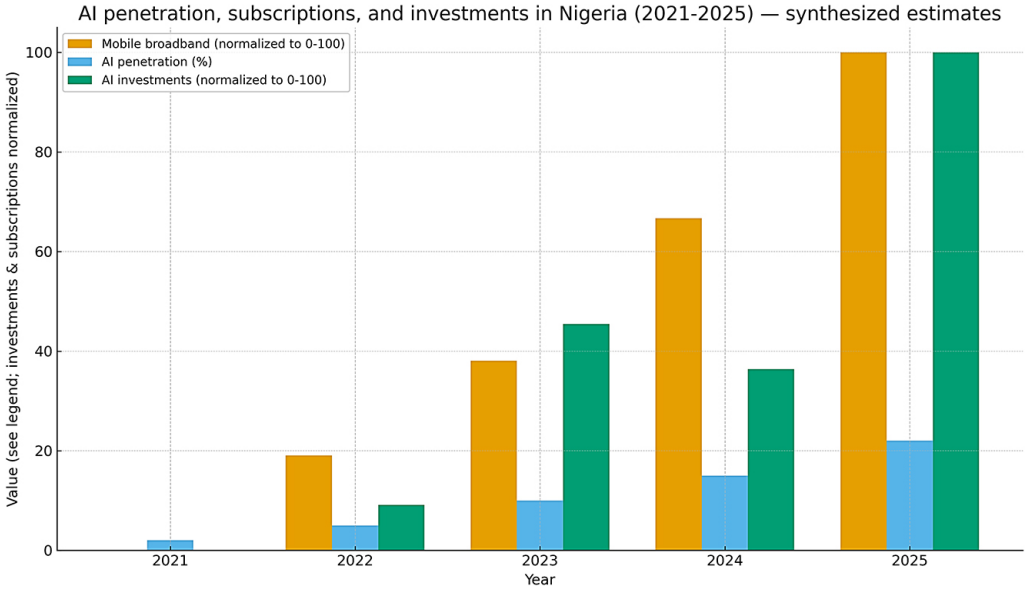

Fig. 2. AI penetration, subscription, and investment in Nigeria between 2021 and 2025

2.3 AI-MMS for supply chain implications in the Global South

In this section, we discuss the benefits and challenges that SMEs realise from the adoption of AI-MMS in general and in their supply chains more specifically. AI-MMS was found to support supply chain innovation by enabling faster, transparent, and

accountable transactions [28]. [29] emphasise that AI improves SMEs' working capital fluidity and order management. In doing so, it enhances supply chain resilience, helps monitor supplier performance, optimises logistics and forecasts demand [30]. AI-MMS's adoption in Africa is a tool to curb fraud, reroute shipments, and reduce inventory costs [31]. Studies such as [32] addressed "Trust" as a barrier to AI-MMS adoption in Africa and the Global South. [33] pointed out that cost and risk perception have adverse impacts on AI-MMS attitudes and that SMEs fear system failure and hidden fees. That study emphasised the necessity of transparent rules, KYC/CDD practices, and digital finance regulation to optimise the benefits of AI-MMS. They confirmed that SME's trust requires actions on user data protection, blocking suspicious players and transparency. [34] report network externalities as the best predictor of AI-MMS adoption in developing countries. They confirmed that endorsing peers piques interest, but actual adoption depends on performance that can be observed. Research has largely examined MMS or the supply chain separately. Few studies apply AI-MMS expressly to the SMEs' supply chain in the global south and developing context, an opportunity this paper begins to address.

Despite the rich literature addressing the benefits and challenges of AI in SME operations, accounting, and supply chain, there is a gap in research that addresses the context of AI-MMS in supply chains as a digital ecosystem. Accordingly, this paper offers a socio-technical insight to address the diffusion of AI-MMS as a technical subsystem and the barriers facing SMEs as a socio-cultural subsystem. These require interdisciplinary approaches pairing DOI with AI risk perception models. This paper also addresses the regulatory progress in the Global South, in general, and the Nigerian context, which is an underexplored area of research.

3 THEORETICAL FRAMEWORK: DIFFUSION OF AI-MMS ECOSYSTEM FOR SUPPLY CHAIN INNOVATION

This digital ecosystem combines MMS, AI, accounting, and supply chain software, which are being developed [35, 36]. Such a combination of products offers a deep data ecosystem for immediate analysis, SME lending platforms, and modular service delivery. [37] argues that SMEs are not mere record-keepers; integration into such ecosystems can enhance efficiency and transparency, allowing SMEs to become creditworthy and well-positioned in the supply chain. Geo-coded household surveys in nine Sub-Saharan countries provide evidence that network coverage is a prerequisite for fintech adoption [37]. To understand the diffusion of AI-MMS as a digital ecosystem, the authors of this paper adopted Rogers' [12] DOI theory categorizes adoption into six stages: innovators, early adopters, early majority, late majority and laggards, based on perceived usefulness, ease of use, trialability and social influence. This theory and its constructs help to understand SME owners' awareness and interest in certain conditions. It also helps conceptualise the relative advantage and social acceptance of emerging technologies such as the AI-MMS ecosystem in the Nigerian context, showing that network effects powerfully drive acceptance. Roger's theory sheds light on the prevailing narrative of the adoption process and issues of trust, risk, governmental support, and regulatory framework across different stages of adoption by SMEs in their supply chain [34].

As shown in Figure 3, Rogers' theory begins with "*innovators*", the curious, experimental risk-takers who enjoy doing new things and who are able to make an early attempt. Next are the "*early adopters*", entrepreneurial individuals who envision the possible benefits and communicate enthusiastically based on their favourable experiences. The "*early majority*" join in when they have proof that the innovation

works and is worth the effort. The "*late majority*" adopts innovations conservatively, typically after they have become routine or economically essential. Finally, "*laggards*" tend to be last, probably due to habit, suspicion or limited availability. These stages altogether reflect the human pace of belief, acquisition and adaptation that directs every technological change.

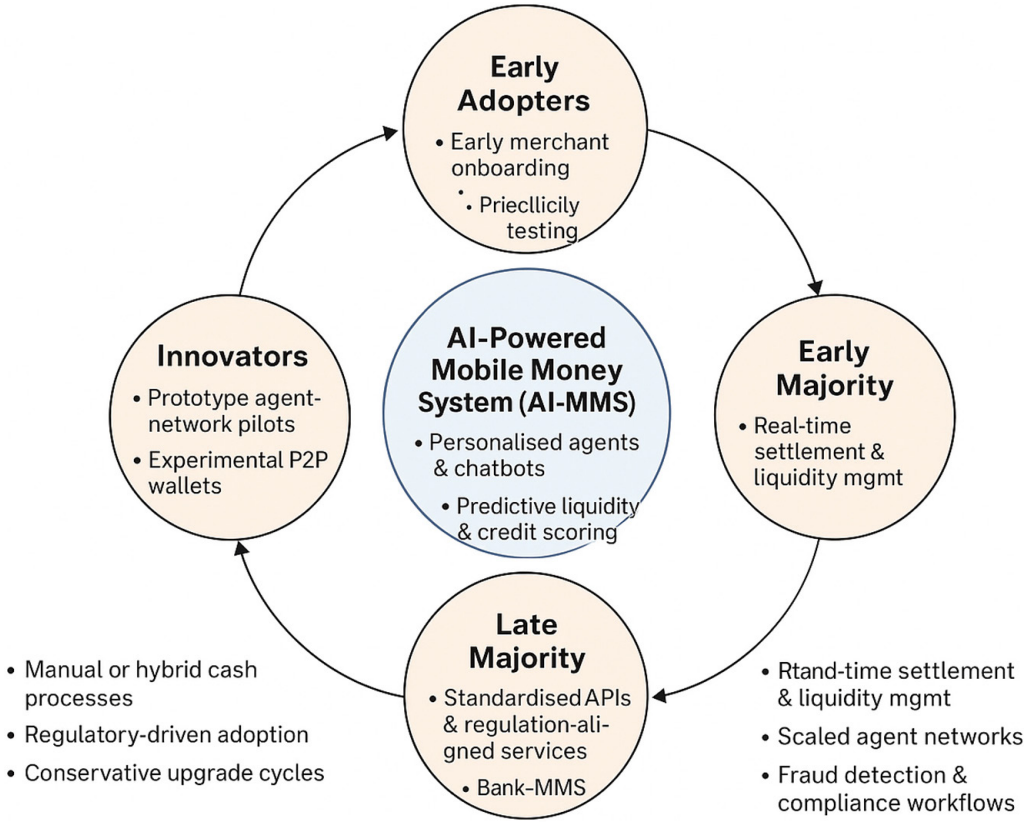

Fig. 3. Diffusion of AI-MMS ecosystem for SMEs' supply chain innovation

4 RESEARCH METHODOLOGY

The study employs an interpretivist epistemology, assuming that the reality of AI-MMS's adoption exists because it is socially constructed through human actions and meanings within the sociotechnical subsystems of this digital ecosystem. The interpretivist strategy was employed because it enables exploration of how Nigerian SME owners envision and construct meaning in adopting AI-MMS within their own sociocultural and economic environments. Given the exploratory nature of the research, an exploratory multiple case study research design was adopted. The technique enables a comprehensive understanding of AI-MMS's sociotechnical realities across various industrial and service sectors in Nigeria. This design is appropriate for under-researched fields and dynamic settings where technological diffusion is influenced by local values, infrastructure and institutional constraints [38].

Data were gathered via 40 semi-structured interviews with owners and managers of SMEs in Nigeria's key regions, Abuja, Lagos, Kaduna, Kano and Port Harcourt (refer to Table 1). We employed a qualitative approach to data collection for the purpose of gaining rich, contextually rich data that would enable us to probe participants' accounts [39]. The interview guide was constructed based on Rogers' DOI theory, focusing on relative advantage, complexity, trialability, observability and trust.

Our informants were asked to confirm whether they had adopted AI-MMS, if they perceived it as beneficial, if they encountered any problems in adopting it, and if they had tackled social determinants of digital change in their supply chain. Every interview lasted between 25 to 45 minutes and was either conducted face-to-face or by video link, depending on the subject's availability. Data were coded with a two-step coding method in NVivo 14 software. Stage one applied template analysis with pre-coded themes based on DOI theory, "*relative advantage*", "*trust*", "*peer influence*" and "*compatibility*" [40]. Inductive coding was applied in stage two to facilitate new, context-specific insight, such as infrastructural barrier themes, digital literacy and fraud risk perception themes.

Table 1. List of research participants

Participant ID	Sector/Industry	Business Type or Role	Region/Location	Key Focus on AI-MMS Adoption
P1 – P5	Retail & Wholesale	Consumer goods, fashion, electronics	Abuja, Lagos	Awareness and early adoption; personal experimentation
P6 – P8	Food & Catering	Restaurants, catering suppliers, fast food	Lagos, Port Harcourt	Efficiency in payments, fraud prevention
P9 – P10	Transport & Logistics	Delivery, shipping, fleet services	Abuja, Kaduna	Cost optimisation, route analytics, tracking
P11 – P13	Medical Supplies & Healthcare	Medical device and drug distributors	Lagos, Kano	Compatibility issues, lack of POS infrastructure
P14 – P16	Manufacturing	Packaging, light machinery, materials	Ogun, Kaduna	Integration with suppliers, cash flow management
P17 – P19	Fashion & Retail	Clothing and accessories outlets	Abuja, Lagos	Payment fraud concerns, predictive analytics for sales
P20 – P22	Agribusiness	Agro-processing and local food markets	Ibadan, Kano	Financial inclusion, supplier payments
P23 – P24	Logistics & Delivery	Transport coordination and dispatch	Port Harcourt	AI for route optimisation, efficiency gains
P25 – P27	Hospitality & Services	Hotels, event management, catering	Lagos	Simplified transactions, customer data analytics
P28 – P30	Automotive & Stationery	Spare parts and office supply SMEs	Abuja	Observability and trialability barriers
P31 – P33	Fast-Moving Consumer Goods (FMCG)	Distribution and retail networks	Abuja, Lagos	Supply chain efficiency, bookkeeping automation
P34 – P35	Financial Services & Fintech	Microfinance, payment agents	Abuja	Regulatory caution, risk management, trust
P36 – P38	Public Sector & Regulators	Ministry of Economy, Financial Authority, Central Bank of Nigeria	Abuja	Oversight, taxation, data governance, and cybersecurity
P39 – P40	ICT & Consultancy	Tech startups, system integrators	Lagos	Innovation advocacy, diffusion facilitation

5 ANALYSIS AND RESULTS

This section presents insights from our 40 in-depth, semi-structured interviews, organised under the following themes derived from key stages and features of

Rogers' model, including *the Knowledge stage*, *the Persuasion stage*, the impact *of the total Social System* and *the decision stage*.

5.1 The knowledge stage: A nascent and incomplete awareness of AI-MMS

Our participants clarified the slow rate of adoption of AI-MMS due to a lack of awareness. P1 confirmed that "*AI-powered applications were scary for me until suddenly my son started using them for his YouTube and social media content generation, which gave me the impression that my MMS account could be smarter and more customisable with AI*". Accordingly, we pointed out the digital divide and knowledge gap regarding the potential of AI for financial inclusion and MMS [41, 42].

During the last year, 75% of our participants who had little to no prior knowledge of MMS started to use AI-MMS due to the wide acceptance of AI technologies in other fields. The "late minority" adopter categories within the diffusion framework conflated AI-MMS with traditional MMS and MB, indicating that the unique value proposition of a telco-led, bank-agnostic financial service is not widely understood. As said by P13, "*I have a branch for my company in Kenya (Mobile Money country), and when I migrated to Nigeria, I found that AI-MMS is not different from what I used to have for the last three years*".

This low level of awareness within the Nigerian SME ecosystem stands in stark contrast to the near-universal familiarity observed in other African markets, such as Kenya, where studies have found that 99% of respondents were aware of AI-MMS services like M-Pesa [43]. P16 emphasised, "*This disparity underscores the foundational challenge for any AI-MMS seeking to penetrate the Nigerian market: the diffusion process is being throttled at the very first stage*". To persuade more SMEs to adopt intelligent financial tools, a significant educational effort is required to build a baseline understanding of the core technology itself. "*Without this foundational knowledge, the advanced features offered by an AI-MMS, such as automated transaction categorisation or predictive cash flow analysis, would be built on a non-existent conceptual platform, rendering them incomprehensible and irrelevant to the target adopters",* emphasised a financial authority regulator, P35.

5.2 The persuasion stage: Perceived attributes and the formation of attitudes

Once awareness is established, the persuasion stage involves potential adopters forming an opinion about the innovation based on its perceived attributes. Our interviews provided rich insights into these perceptions, which shaped the willingness of SME owners to consider AI-MMS.

Relative Advantage: Maintaining a competitive advantage is the main driver for SMEs to innovate and enhance the effectiveness of their supply chain. P31, "*In my company, we heavily adopt AI-MMS to evaluate suppliers, manage tendering, and conduct payment transactions with fewer steps for verifications and accountancy procedures*". Another advantage pointed out by P24, who emphasised the security benefits, stated, "*You cannot be walking around with cash, so I feel it's more convenient*". Another supply chain executive, P19 from the catering industry, highlighted the importance of financial discipline, saying, "*I don't like carrying cash around, because taking out cash makes me overspend, and someone who is trying to stabilise a business needs to keep track of his spending*". P15, from the fast-moving consumer goods sector, pointed out that "*AI-MMS offers automated bookkeeping, expense tracking, and even predictive analytics*

to help an SME owner manage cash flow more effectively". It appears that it offers a compelling value proposition for businesses seeking stability and growth [43]. This capability to transform transaction data into actionable business intelligence represents a significant relative advantage over both cash and basic MB [37].

Compatibility: Using AI-MMS to gradually innovate in business processes, production, and services requires consistency with existing values, past experiences, and the need to achieve compatibility. Our findings revealed a mixed landscape. On one hand, the preference for digital bank transfers over cash for business payments suggests a cultural readiness for cashless solutions. However, a significant compatibility barrier was also identified. As P11, from the medical appliances sector, who preferred using cash for her supplies, explained, "*it's easier when I use cash because they usually don't have a POS (Point of Sale) terminal. It also helps me overcome the administrative procedures of approving medical supplies, as all verified drugs are listed in the system*". This highlights a critical ecosystem challenge: an AI-MMS for supply chain payments is only viable if both the SME and its suppliers are equipped and willing to use it [44]. The fact that all participants dealt with local suppliers means that the system's compatibility must align with the technological readiness of small, local businesses, which may be limited.

Complexity and Trialability: AI-MMS's perceived complexity is a significant barrier to adoption. The multilayered system interfaces, databases, and business intelligence raise complexities for some stakeholders. The system allows financial regulators to access cybersecurity and verify transactions. As P37 from the Ministry of Economics, the AI-MMS is viewed as a "*black box*" that requires trialability, the ability to experiment with an innovation on a limited basis, which becomes crucial to overcoming this. She said, "*I think even if someone recommends it to me, I'll have to ask about its efficiency*". P36 confirms that "*last year we collected 80% extra sales tax by monitoring the system and tracking the profitability of each supplier in the chain*". This indicates that SMEs and other potential adopters, such as individual users and regulators, will have different versions of the app interface, and each group of users needs to see demonstrable proof of the system's reliability and effectiveness. So, we can confirm that offering pilot programmes, free trials with core features, or compelling case studies of similar businesses would help reduce AI-MMS's perceived complexity and encourage initial adoption.

5.3 The social system: Navigating critical environmental barriers

Our participants confirmed that the diffusion of an AI-MMS is not just about individual perceptions; it is heavily influenced by the broader social and technical environment. Our interviews uncovered several critical environmental factors that currently act as powerful barriers to adoption in Nigeria as a Global South context.

Trust, Security and Fraud: The Social Perspective of Trust, Security, and Fraud in the Global South revealed a complex environment. We observed a deep-seated mistrust stemming from the high rate of fraud in Nigeria, which slowed the diffusion of AI-MMS across different segments and industries. P17 explained why she declined to use AI-MMS to pay suppliers; she explicitly "*cited negative past experiences with this emerging system by friends and peers as a major deterrent*" and mentioned a service plagued by "*mass fraud*". On the contrary, P27 said, "*I like the algorithms that predict my financial performance and send me a warning before I reach the monthly spending limit and flag a cash shortage*". AI-MMS relies heavily on machine learning algorithms to detect anomalies and flag potentially fraudulent transactions in

real-time, offering a level of security far superior to traditional methods [23]. P38, *from the financial regulatory authority, confirmed, "Since AI-MMS proactively identifies and blocks suspicious activities, we are authorised with a trusted certification*".

Infrastructure and Network Reliability: Due to the weak network infrastructure, traditional MMS systems faced issues with system trust. P16, 17, 19, 20 identified the "*Nigerian network problem*" as a primary challenge for any network-based system, including the AI-MMS. As P33 succinctly put it, "*It is probably a Nigerian network problem, maybe when their server is down or something, it won't be more than that, because I think it all depends on the network and server*".

The Role of the Banking and Regulatory Ecosystem: Nigerian regulators involved GloXchange to enhance the regulation of telecommunication compliance in AI-MMS. But, as P38 confirmed, "*this partnership slows innovation and limits the disruptive potential of telco-led AI-MMS*". The aforementioned findings confirm that the diffusion of an AI-MMS is influenced not only by individual perceptions but also by the broader social, technical and regulatory environment in which SMEs operate. Our interviews with P9, 10 and 38 uncovered the complexity of this social system in Nigeria, in the context of the Global South. The successful implementation of AI-MMS hinges on navigating this ecosystem, where issues of infrastructure, regulatory posture and data governance are paramount. P19 expressed that "*a recurring and foundational barrier is the state of the nation's digital infrastructure and servers that need to be echoed universally*".

Risk management: Our participants from the financial authorities conveyed their primary concern about risk management and consumer protection. P34 said that "*AI-MMS creates a regulatory posture that, while not overtly hostile, is inherently cautious, which can slow the pace of diffusion*". This led to an increasing focus on data privacy within the societal and regulatory spheres. P32, from the Ministry of Economy and Digital Innovation, confirmed, "*We are enthusiastic about the efficiencies AI can bring to supply chains, optimizing logistics, forecasting demand, and ultimately making our SMEs more competitive. But we cannot pursue this at the cost of our citizens' data privacy*". According to [45], the Nigerian Data Protection Act (NDPA) states that any AI-MMS must be built on principles of privacy-by-design. "*While we encourage the use of data, we also require companies to be transparent with their customers and to implement robust security measures*", emphasised P38.

5.4 The decision stage: A hesitant openness to adoption

The decision to adopt innovation relies on knowledge, persuasion, and social system factors in the context of AI-MMS. Our interviewees with Nigerian SME owners are in a state of hesitant openness. A majority of participants indicated they were "*open to using AI-MMS as a means of payment in their supply chain*", with P17 stating, "*Yes, I think I would definitely be more comfortable with that (AI-MMS), without having to go through the process of going to a bank, it would be more convenient*". This demonstrates a clear recognition of the potential relative advantage. But this openness is heavily conditioned by the underlying problems, network unreliability and the high risk of fraud, which creates significant reluctance. This was perfectly captured by P29, from the fashion retail sector, who stated she would only use AI-MMS if she was "'*cornered' by her suppliers or customers*". Our findings refer to SME owners in the global south as non-active champions of this new technology. They are cautious, pragmatic potential users who are fully aware of the contextual risks. They will not adopt an AI-MMS based solely on its theoretical promise; they will need

overwhelming evidence of its security, reliability and tangible value before making the decision to integrate it into their critical supply chain operations.

Our participants emphasised that they are not outright rejecting the supply chain innovation associated with AI-MMS; rather, they are in a state of "*hesitant openness*" or "*conditional adoption*". It seems that they are aware of the potential advantages but are equally constrained by the tangible risks of their operating environment. The "pull" factor towards adoption is driven by the clear and compelling operational efficiencies that an AI-MMS can offer. P19, from a fashion retail business, found accelerated benefits in the systems' analytical capabilities by expressing the following: *"Running a fashion retail business relies heavily on finding trends and predicting future fashion lines. Currently, it's mostly guesswork. If an AI system could analyse sales data and social media to give me a better forecast of what styles will be popular next season, that would be a game-changer. It would reduce my inventory risk and cut down on waste. That is a technology I would pay for*". Similarly, P23, an owner in the logistics and delivery business, was drawn to the potential for cost savings by saying, "*Fuel and vehicle maintenance are my biggest expenses. The idea of an AI that can analyse traffic and delivery schedules to find the most efficient routes is incredibly appealing. In our business, even a 5% reduction in fuel consumption is a massive win. And the ability to track my delivery fleet in real-time would give me and my clients peace of mind*".

Another reason to use AI-MMS is that it gives you access to safe financial management. P17 had trouble getting a business loan before. He was hopeful about the possibility of fairer credit checks: "*It's hard to get a loan when you're just starting out because banks always want to see years of perfect records. If an AI-MMS could review my real-time cash flow and transaction history to make a credit decision, that would feel fairer. It would be based on how my business is actually doing today, not just on old paperwork. That could open doors for many of us*". This sentiment was echoed by P19, who had been a victim of payment fraud, saying, "*We lost a significant amount of money last year to a payment scam. It was devastating. An AI system that could analyse transactions in real-time and flag anything suspicious before the money is gone... that's not a luxury; that's a survival tool. For me, the security feature is the most important selling point*".

Despite this clear recognition of the innovation's relative advantage, the decision to adopt is ultimately held back by the environmental barriers discussed previously. The final sentiment of many SME owners can be encapsulated by the cautious perspective of one participant: The potential is huge, "*I see that. Automated bookkeeping, better security, maybe even getting a loan faster, it all sounds great. But I have to be realistic. What happens when the mobile network is down for half the day? What guarantee do I have that my business data is truly secure from hackers? I am open to it, very open. But I would need to see it working perfectly for others in my market for a long time before I would risk my own supply chain on it*". This statement perfectly illustrates the state of hesitant openness.

6 RESEARCH DISCUSSION

While research in Kenya and Uganda finds high utilisation and awareness of AI-MMS, Nigerian SMEs have low exposure, with an unwilling attitude. Respondents were consistent with the literature on critical barriers such as infrastructure and fraud [44, 45]. While cost-effectiveness is the primary driver of adoption in East African studies, Nigerian SMEs prioritised stability in systems and trust in users. Peer referral was seen as critical but not significant enough to induce adoption. The nuanced distinction highlights that while DOI categories are valid, their relative

salience is context-specific. Our findings necessitated an update to the theoretical framework that relies on the sociotechnical insight of AI-MMS as a digital ecosystem rather than merely a business model innovation [37]. Although classical DOI constructs remain relevant, emergent variables developed organically from narrative data. Trust was found to be the most important factor, namely trust in the brand, consistency of services and believability of transaction alerts. Supply-side readiness, i.e., how prepared the suppliers themselves are digitally, was also a significant driver. Finally, the perceived ecosystem maturity, which is the sense that AI-MMS is widely used and adequately supported, continues to surface as a prerequisite for usage.

Our findings also offered both convergent and divergent perspectives in relation to current studies on the adoption of AI-MMS by SMEs in the Global South. Apparently, while other studies, such as [1, 2, 3], mention that AI-MMS adoption is largely accelerated by peer pressure and perceptions of utility, our present study attests that, for Nigerian SMEs, decision options are largely constrained by infrastructural capabilities, trust issues, and the absence of conceptual differentiation between AI-MMS and smart MB services. The latest research has confirmed that AI-MMS adoption performs best where telecom-led models enable service delivery in an inclusive fashion without relying on the formal banking structure [13, 15, 42]. Kenya and Tanzania are examples of countries where users' familiarity and digital financial literacy have led to extensive use of platforms like M-PESA. On the other hand, the Nigerian case presents a unique institutional issue, whereby bank-driven AI-MMS operations are mandated in policy guidelines, which serve as entry barriers for telco suppliers and are confusing to end-users [34]. Findings confirm this deviation, whereby different stakeholders misnamed AI-MMS as synonymous with smart MB, which undermined their confidence and views on the technology.

7 CONCLUSION

This study makes a double contribution. At a theoretical level, it enhances the DOI model by proposing new context-bound variables to explain the adoption of Nigerian fintech. At a practical level, it emphasises the need for AI-based MM systems that support bridging infrastructural shortcomings, fostering digital trust, and optimising supply chains. The focus on localised issues and frontier technologies, the framework developed in this study offers practical suggestions to policymakers, fintech builders and SME ecosystems. Our research highlighted the significant influence of contextual determinants on the adoption of AI-MMS. Unlike East African settings, where telecom-led MM models thrive [15, 44], the bank-led approach in Nigeria has created confusion, reduced accessibility, and eroded user trust. Participants conflated AI-MMS with smart mobile banking, highlighting the need to intensify targeted education and product differentiation [19]. The relatively low awareness of the AI-MMS value proposition is a significant barrier to adoption. The study also confirmed that infrastructure bottlenecks, most notably unstable network connectivity, continued to hinder digital financial inclusion. Testimonies from the participants illustrated how slight disturbances to mobile network connectivity could discourage transactions and disturb supply chain activities. Furthermore, the recollection of earlier dishonest MM platforms such as TV Mobile corroborates deep-rooted mistrust between users, consistent with [32]'s argument on the necessity of digital trust in fintech adoption.

To bridge these gaps, the study developed an expanded framework based on Rogers' DOI and integrated three necessary constructs that are not included in

traditional DOI models: (1) Trust in service providers, (2) Supply chain ecosystem readiness and (3) Perceived maturity of the digital financial environment. These expansions offer a deeper understanding of innovation adoption in environments characterised by regulatory entanglement and digital fragmentation. AI is put forward as a principal facilitator of the development of Nigerian SMEs' required reliability and security. AI-based tools may assist in forecasting network breakdowns, identifying suspicious activities, and tailoring user experiences, thus minimising resistance and increasing trust [29]. While AI itself was not specifically mentioned, the challenges identified by the participants correspond with AI's strengths, indicating a promising future direction. Lastly, this study has both practical and theoretical contributions. This is an empirically grounded, context-specific theory of AI-MMS adoption in Nigeria, presenting actionable channels, namely through AI integration, to further the ultimate goal of financial inclusion. Policymakers, financial services institutions and digital entrepreneurs must collaborate to ensure that AI-MMS is both technically strong and socially accepted, contextually aligned and trust-enhancing.

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9 AUTHORS

Dr. Mostafa Mohamad is a scholar and industry expert in Digital Transformation, AI for Business, FinTech, Digital Innovation and Business Analytics. Before joining Zayed University, he had 22 years of academic experience at Manchester Business School, Newcastle Business School, Leeds Business School and Salford Business School. Mo served as a director of PG programmes, a director of Admissions and a deputy DBA director. He also led significant research initiatives in Virtual Reality, Machine Learning, Artificial Intelligence, FinTech and Technology transfer across various sectors, including energy, automotive, tourism and telecommunication. He is an associate editor in Q1 journals in IS & Digital Marketing (E-mail: mostafa.mohamad@zu.ac.ae).

Dr. Michael Nii Laryeafio is Lecturer in information systems and business with a passion for inspiring and equipping the next generation of students and professionals for over 10 years. Known for his dynamic teaching style and ability to simplify complex concepts, Michael has received accolades for his ability to connect with students and foster a stimulating learning environment. Michael is currently a business lecturer, Module leader and dissertation supervisor at Arden University in the UK. With a bachelor's degree in economics from the Kwame Nkrumah University of Science and Technology, Michael holds a PhD and an MSc in Information Systems from the University of Salford, UK, with a focus on educational technology. Michael is also a member of UKAIS and holds a Fellowship of the Higher Education Academy (FHEA).

Dr. Ebimoboere Koroye is a dedicated scholar and Lecturer specialising in Financial Accounting and management. She holds a PhD and MSc from the University of Bradford, UK, and a BSc in Accounting from the University of Benin, Nigeria. With a strong foundation in both academic and theoretical, as well as practical applications, Dr. Ebimoboere has lectured at various institutions in the UK, delivering courses in Economics, accounting and finance, business and management, and has over four years of teaching experience at both undergraduate and postgraduate levels. Her teaching philosophy emphasizes critical thinking, ethical decision-making

and inclusive learning. She is proficient in data analytics and educational technologies, and actively contributes to curriculum development and student mentoring. Beyond academia, she serves as a volunteer accounting officer, demonstrating her commitment to community service and financial integration.

Derick Nyame is a seasoned professional in strategic and operations management with over a decade of experience leading multidisciplinary teams across the UK. He currently serves as Director of Dominion Plus, where he oversees high-impact projects in construction and project management across health, commercial and private sectors. Derick's leadership is grounded in analytical thinking, creativity and a deep understanding of organizational dynamics, enabling him to deliver results that align with long-term strategic goals. Previously, Derick held the role of Chief Security Officer at New City College, where he developed and implemented comprehensive security strategies that integrated physical and cybersecurity frameworks with institutional objectives. He has recently completed an MBA in Entrepreneurship at the University of Wolverhampton, building on his academic foundation in business and developing applied skills in problem-solving and communication.

Dr. Samuel Ayertey is currently a business lecturer at Arden University, UK, and a visiting lecturer at the University of Cumbria, UK. He has a PhD in marketing from the University of Plymouth, UK, and an MBA from the University of Wales, UK. His teaching covers key areas such as organisational behaviour, leadership, strategic management and postgraduate research supervision. Samuel has worked as a digital marketing executive for a number of marketing companies in the UK and Africa. He has presented several conference papers in the field of digital marketing, particularly on the impact of emerging technologies on service failure and recovery strategies. He has published extensively in academic books and journals, including the Interdisciplinary Journal of Economics & Business Law. Samuel is a fellow of the Higher Education Academy (FHEA).

Dr. Adelina Emini earned her Ph.D. in Marketing from the University of Prishtina, Kosovo. She serves as the Manager of International Relations at Radio Television of Kosovo (RTK) and as the Director of the Academy of Leadership Sciences Switzerland (ALSS) for Albania, Kosovo, and North Macedonia. She is also the co-founder of the Forum for Leadership and Diplomacy in Prishtina. Dr. Emini has taught at the University for Business and Technology (UBT) and currently lectures at ALSS. In 2022, she was an International Visiting Scholar at the College of Business, Florida State University (FSU), USA.