Factors Influencing User Adoption of Artificial Intelligence in the Telecommunications Industry: Challenges and Strategic Approaches

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Abstract— **The potential of Artificial Intelligence (AI) to revolutionize the telecommunications sector is undeniable, offering opportunities to enhance service delivery, boost operational efficiency and elevate customer experiences. Despite its growing prominence across industries, the widespread adoption of AI within telecommunications remains a multifaceted challenge. This paper investigates the critical factors influencing users' adoption of AI technologies in this sector, with a particular focus on technological readiness, perceived benefits, ethical considerations, data privacy concerns and socioeconomic barriers. The study highlights how telecommunications companies must address these diverse elements to effectively promote AI adoption among users. Specific strategies discussed include enhancing user awareness of AI's advantages, implementing robust data security protocols and ensuring transparency in AI systems. Furthermore, the paper emphasizes the need for tailored AI solutions that cater to a broad spectrum of user demographics, especially those from lower socioeconomic backgrounds, to foster more inclusive adoption. By providing a comprehensive analysis of these factors, the paper contributes to the existing literature on AI adoption in telecommunications and offers actionable recommendations for industry stakeholders. The findings aim to inform decision-makers in the telecommunications industry on how to overcome adoption barriers, drive innovation and enhance the overall service experience through AI integration.**

Keywords— *Artificial Intelligence, Telecommunications, User Adoption, Technological Readiness, Socioeconomic Barriers, Data Privacy, Strategic Approaches, AI Integration*

INTRODUCTION

The telecommunications industry is undergoing a profound transformation, catalyzed by rapid advancements in Artificial Intelligence (AI). AI technologies such as Machine Learning (ML), Natural Language Processing (NLP) and Deep Learning (DL) are increasingly employed to optimize network operations, enhance customer service and improve decision-making processes. In recent years, the global telecommunications industry has increasingly adopted AI to enhance operational efficiency and drive innovation. In alignment with these global trends, Zambia launched its National Artificial Intelligence Strategy in November 2024, signaling a national commitment to leveraging AI for socioeconomic development [1]. This strategic move highlights the growing importance of AI adoption across various sectors including telecommunications, which plays a critical role in digital transformation and connectivity. However, despite the promising potential of AI, user adoption within the Zambian telecommunications sector remains uneven due to factors such as limited digital literacy, trust concerns, infrastructural constraints and organizational readiness. Understanding the factors that influence user adoption of AI in this sector is critical for stakeholders aiming to harness its full potential while mitigating associated risks. This study aims to investigate the key factors influencing user adoption of AI in this context, identify prevailing challenges and propose strategic approaches to facilitate more inclusive and effective AI implementation. In order to explore the facilitating factors and barriers to AI adoption in the telecommunications sector, this study draws on three well established theoretical frameworks: the Technology Acceptance Model (TAM), the Unified Theory of Acceptance and Use of Technology (UTAUT) and the Technology Organization Environment (TOE) framework. TAM, developed by Davis in 1989, emphasizes perceived usefulness and perceived ease of use as critical determinants of individual technology adoption. It is essential for understanding individual user behavior, especially how users perceive AI tools in terms of usefulness and ease of use [2]. UTAUT builds on TAM by integrating additional constructs such as performance expectancy, effort expectancy, social influence and facilitating conditions to provide a more comprehensive understanding of user behavior [3]. This model is crucial for analyzing how external pressures and conditions like management support or training affect AI adoption within the organization. Complementing these individual level models TOE framework offers an organizational perspective identifying how technological readiness, organizational capabilities and external environmental factors influence technology adoption. Together, these models provide a robust foundation for

analyzing the multi-dimensional nature of AI adoption in the telecommunications industry.

A. Definition of key words

Telecommunication: is the exchange of information over distances using electronic means, such as phones, radios, satellites and the internet [4].

Artificial intelligence: is a technology that enables machines to mimic human intelligence such as learning, reasoning and problem-solving [5].

User adoption: Is the process of individuals or organizations accepting, integrating and effectively using a new technology, system, or product [3].
Ease of Use: is the degree to which a technology is perceived as being effortless and user-friendly [2].

Research Objectives

Investigate the key determinants that influence user adoption of AI technologies in the telecommunications sector.

Evaluate the impact of perceived benefits on user acceptance of AI-driven telecom services.

Examine the level of user familiarity with AI applications in Zambia's telecommunications industry and analyze its influence on adoption behavior.

Formulate evidence-based strategic approaches that telecommunications companies can deploy to overcome adoption barriers and promote inclusive AI integration.

LITERATURE REVIEW

The telecommunications industry plays a pivotal role in Zambia's socio-economic development, contributing approximately 2.6% to the country's Gross Domestic Product (GDP) as of 2023 [6]. This figure highlights the sector's growing economic significance driven by widespread mobile connectivity, digital services and ongoing infrastructure investments. As the industry evolves, AI has become a cornerstone of innovation offering immense potential for improvement. In regions where AI adoption in telecommunications is well-established, companies use machine learning and automation to improve customer support, predict network failures and strengthen cybersecurity. AI-powered analytics help telecom providers make informed decisions regarding service improvements, while predictive maintenance reduces downtime by addressing potential technical issues before they escalate. Additionally, AI enhances fraud detection, preventing financial losses related to cyber threats. Similar applications have been demonstrated in agriculture through microcontroller-based monitoring [7] and in Zambia's mining industry where machine learning has been used for pollutant prediction [8].
For the telecommunications industry in Zambia, AI adoption could mean more reliable network, cost-effective operations and a competitive edge in the market. However, despite AI's potential, its adoption within the Zambian telecom context

remains uneven. It is influenced by various factors such as technological readiness, perceived benefits, ethical considerations, data privacy concerns and socioeconomic barriers. Understanding the factors influencing user adoption is therefore essential, not only to improve innovation uptake but also to ensure the sector continues contributing meaningfully to the national economy.

Technological Readiness

Technological readiness refers to the extent to which an organization possesses the infrastructure, digital capability and technical expertise necessary to adopt and effectively utilize new technologies such as Artificial Intelligence [9]. It encompasses elements such as ICT infrastructure (hardware/software), Data availability and quality, Workforce ICT skills, Integration with legacy systems and Cybersecurity and data protection mechanisms. In the telecommunications sector, technological readiness is a foundational enabler for the successful deployment of AI technologies in areas such as network optimization, predictive maintenance, customer experience management and fraud detection [4]. Several studies globally have found a strong relationship between technological readiness and AI adoption, in [10] Dwivedi emphasizes the importance of a mature IT infrastructure in AI adoption. The study highlights that telecom firms lacking robust digital frameworks struggle to experiment with or scale AI applications effectively. They argue that technological readiness directly impacts an organization's innovation capability and agility, enabling firms to use AI for operational efficiencies and market competitiveness. Without this foundational infrastructure, AI projects tend to stay small, disjointed and ultimately ineffective. In [11] Wamba-Taguimdje investigated AI adoption and found that technological readiness significantly influences AI adoption success in emerging market telecom firms. Key enablers include robust cloud infrastructure, which offers scalable processing power and data interoperability, which ensures AI systems can access and analyze data across various platforms. This study emphasized that readiness goes beyond technology but it also involves organizational capabilities like IT governance and workforce digital skills. Zambia's National Digital Transformation Strategy (2024–2027) in [1] emphasizes the importance of digital infrastructure, aiming to expand broadband coverage and enhance digital literacy across the country. However, challenges persist, particularly in rural areas where internet penetration remains low. According to the International Telecommunication Union [12], Zambia's internet penetration rate was 31.2% in 2023. And the main regulatory body for the telecommunication sector the Zambia Information and Communications Technology Authority (ZICTA) has recognized the need to assess the country's AI landscape. In May 2024, ZICTA, in collaboration with BongoHive and the Ubuntu AI Community, launched a survey targeting various sectors to inform national AI strategies [13]. These initiatives indicate a growing awareness of the importance of technological readiness for AI adoption

Organizational Factors

Schein in [14] defines organizational culture as the shared values, beliefs, norms and practices that shape the behavior and interactions of members within an organization. He further adds that It influences decision-making, communication styles and openness to innovation, including the adoption of new technologies. Organizational factors such as leadership support, culture, structure and resource availability play a pivotal role in AI adoption by shaping how effectively new technologies are integrated, accepted and sustained within the enterprise. A recurring theme in AI adoption is the role of leadership. Organizations with executives who actively champion AI initiatives tend to experience smoother transitions and higher success rates. Leaders who understand AI's potential can drive investment, foster collaboration between departments and ensure alignment with business objectives [15]. In [16] the authors argue that AI adoption is heavily influenced by how organizations manage relationships internally. They find that strong inter-departmental collaboration and a learning-oriented culture support better outcomes in AI transformation projects. In [17] the research examines AI readiness from an organizational perspective. It finds that clearly defined responsibilities, internal governance and leadership alignment are crucial. When there is uncertainty about who owns or oversees AI projects, progress is slow. The study in [18] emphasizes that organizations with a developmental culture characterized by values such as flexibility, innovation, openness to change and employee empowerment are more likely to adopt advanced technologies. However the willingness of employees to embrace AI technologies is another critical factor. The study in [19] emphasizes that people's expectations and actual experiences with AI influence their willingness to accept and use the technology. The authors argue that when employees enter an AI initiative with realistic expectations, they're more likely to respond positively if the technology performs well. These expectations are often shaped by the organization's culture, especially how leadership communicates about AI, whether employees are involved in early stages and how transparent the process is. Financial readiness plays a crucial role in determining whether an organization can successfully adopt AI technologies [20]. Implementing AI often requires significant investment in several areas, including acquiring high-quality data, training machine learning models, upgrading IT infrastructure and hiring or upskilling specialized talent. For large telecom operators, these expenses may be manageable, but for smaller companies with limited budgets, the financial burden can be a major barrier. Without adequate financial resources, these organizations may struggle to move beyond pilot projects or scale their AI initiatives effectively.

Environmental Factors

In [21] Horani describes Environmental factors as external conditions and influences such as legal, economic and social forces that impact how organizations operate and make decisions. These external forces shape how and when companies will deploy AI technologies. In Zambia, the Data Protection Act No. 3 of 2021 provides the legal framework for how personal data should be collected, processed and protected [22]. This legislation places important responsibilities on telecom companies, especially when using AI technologies that rely on customer data such as chatbots, recommendation engines, or fraud detection systems. The Act requires firms to implement safeguards that ensure user privacy and data security, which directly influences how AI solutions are designed and deployed. Since the Act is still relatively new, some areas like enforcement and sector-specific guidelines are still developing, creating uncertainty that can affect decision-making around AI projects. Market competition is another force to consider. The Zambian telecom market is becoming increasingly competitive, with players such as MTN and Airtel investing heavily in digital transformation to improve service delivery and customer engagement. This pressure to innovate pushes companies to explore AI solutions and firms that delay AI adoption risk losing market share to more technologically advanced rivals. Vendor partnerships is another factor affecting the telecom industry. Local telecoms often rely on partnerships with international technology providers to access AI expertise and infrastructure. Collaborations with firms such as Huawei, Ericsson, or ZTE can provide access to AI-powered network management tools or cloud platforms without the need for heavy internal investments. These partnerships are especially important in Zambia, where in-house AI capabilities and infrastructure are still developing. Regional collaborations, such as the Ubuntunet Alliance, illustrate the importance of knowledge sharing and reducing digital brain drain to support sustainable AI adoption [23]. Lessons can also be drawn from environmental monitoring research in Zambia, which has shown how data-driven approaches can provide critical insights into public health outcomes [24].

METHODOLOGY

This section outlines the research design, Theoretical framework, sampling technique and data analysis methods employed in this study. The objective was to understand how different user-related factors such as technological readiness, perceived benefits, ethical concerns, data privacy issues and socioeconomic circumstances affect the willingness to adopt AI technologies in this sector. A quantitative research approach was selected to gather measurable data that could offer insights into patterns and relationships among variables. The use of a structured questionnaire allowed for a broad collection of responses from participants, enabling a general understanding of user perspectives.

A. Research Design

A cross-sectional survey design was chosen for this study. This design was appropriate because it allowed for the collection of data from all the three (3) main telecom companies in Zambia at a single point in time. The aim was to assess the current attitudes, perceptions and challenges experienced by users regarding AI technologies in telecommunications.

The research targeted users of telecommunications services in Zambia who had varying levels of awareness and theoretical exposure to AI-enabled systems, such as chatbots, predictive customer support tools, automated billing systems and network optimization services. While these technologies have not yet been fully implemented in the Zambian telecommunications sector, they were included in the questionnaire to help

respondents visualize potential applications of AI and provide informed opinions based on familiarity, expectations or indirect experiences through global trends and related services.

B. Theoretical Frameworks

This study adopts an integrated approach by combining three well-established frameworks TAM, UTAUT and TOE to explore the factors influencing AI adoption in the telecommunications sector.

TAM emphasizes two core constructs: perceived usefulness (PU) and perceived ease of use (PEOU), which shape an individual's intention to adopt technology. In this study PU was assessed using questions such as:

[1] How beneficial is AI for improving customer service and other support services in telecoms?
[2] Do you think AI adoption in the telecommunications sector will improve your company's competitive advantage?
[3] How do you perceive the role of AI in improving operational efficiency within your company?

PEOU was explored through items like:

- How important is perceived ease of use when considering the adoption of AI technologies in your organization?

UTAUT expands on TAM by incorporating additional factors such as performance expectancy, effort expectancy, social influence and facilitating conditions. Questions asked include:

Performance Expectancy:
1. What is your general perception of AI in the telecommunications industry?

Effort Expectancy:
A. Have you personally interacted with or used AI-driven tools or technologies in your role?"

Social Influence:
B. What factors do you consider most important when adopting AI in telecommunications services?

Facilitating Conditions:
C. What strategies has your company implemented to overcome the challenges of AI adoption?
D. How do you think the government of Zambia can support the adoption of AI in the telecommunications sector?

TOE framework broadens the analysis by incorporating technological, organizational and environmental contexts.

Technological Context:
[1] Do you believe that the current infrastructure in Zambia supports AI adoption in telecommunications?

Organizational Context
[2] What challenges related to AI adoption do you face at the organizational level?
[3] What strategies has your company implemented to overcome the challenges of AI adoption?

Environmental Context
1. What do you believe are the primary reasons for user hesitation to adopt AI technologies in telecom services in Zambia?

2. In your opinion, what role should ZICTA play in supporting the adoption of AI technologies in Zambia's telecommunications sector?
3. To what extent do you think Zambian users trust AI technologies in telecommunications?

C Survey Results

A survey conducted for this study highlights the key determinants influencing AI adoption in Zambia's telecom sector. As shown in Figure 1, data availability and quality (74%) and skills and training (70%) were most frequently cited by respondents, indicating a strong emphasis on reliable datasets and human skills as primary enablers of AI adoption. Organizational readiness (58%) and cost and return on investment (54%) followed, suggesting that leadership support, cultural preparedness and financial justification remain critical considerations for adoption. Moderately cited factors included technological infrastructure (50%) and integration with existing systems (48%), reflecting persistent challenges around compatibility with legacy systems. On the other hand government policies (34%) and data security and privacy (10%) were less emphasized, showing that external regulatory frameworks and security concerns, while relevant are not currently perceived as the most pressing barriers.
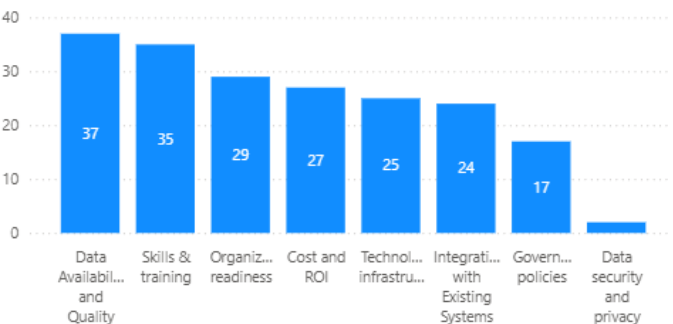

Figure 1:Factors influencing AI Adoption

These findings demonstrate that the sector's adoption priorities are concentrated on internal readiness and skills building rather than external policy or compliance issues.

The perceived usefulness of AI is a significant predictor of user acceptance. The majority of respondents believed that AI offers considerable advantages in telecommunications:86.2% viewed AI as very beneficial for improving customer service. 76% considered it very significant in enhancing operational efficiency.

Figure 2: Customer service vs Operational efficiency

Figure 3 shows that 82% of telecom employees have interacted with AI tools, though the depth of engagement varies. Familiarity levels are generally moderate: 52% rated themselves

at 3/5, while 30% reported higher familiarity (4–5/5) and only 12% showed low familiarity (1–2/5)
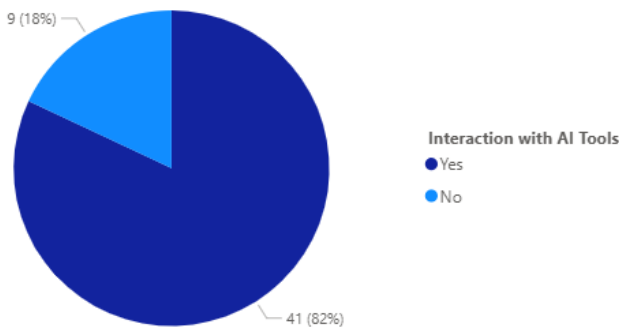

Figure 3: Interaction with AI Tools

The findings show that respondents with higher familiarity tended to see AI as more useful, while those less familiar raised concerns about trust, costs, resistance to change, integration issues and infrastructure or policy limitations. Figure 4 highlights a clear trust–familiarity gap: although many participants reported being somewhat familiar, trust levels lagged behind, with most showing only neutral trust (about 60%) and very few (8%) expressing strong trust. This indicates that while familiarity is important, building trust is essential for sustainable adoption.

Figure 4: Familiarity vs Trust

DISCUSSION

It's evident from this study that while many telecom professionals recognize the strategic value of AI, there are still barriers slowing down its full adoption. Some of the main challenges include weak infrastructure, limited training opportunities, privacy concerns and in some cases, hesitation simply because employees are not yet familiar with AI tools. One clear insight is that people are more willing to support AI when they can see its practical benefits. This mirrors what other studies on technology acceptance have found, perceived usefulness strongly influences adoption. Another key factor is organizational readiness. Companies that prepare their workforce through training programs, building strong partnerships with technology providers and investing in reliable IT infrastructure tend to experience smoother adoption of AI. But readiness is not just about having the right technology. It also involves leadership buy-in, cross-departmental teamwork and creating a culture that encourages experimentation and innovation.

The findings revealed a persistent gap between familiarity and trust in AI. While most professionals had heard about AI and understood its potential, actual trust in the technology was relatively low. This suggests that employees may still have doubts. Concerns included potential job displacement as well as ethical risks such as bias in decision-making and lack of transparency. To overcome this, organizations need to focus on open communication, involve employees early in AI projects

and demonstrate how AI can complement rather than replace human roles. These concerns mirror ethical debates raised in higher education contexts when digital tools such as electronic notes were introduced [25].

RECOMMENDATIONS

Based on these findings, the following recommendations are proposed:

A. For Telecommunications Companies

1. Invest in Workforce Training: Employees need confidence in using new technologies. This can be achieved through regular training programs and workshops, such initiatives will not only upskill employees but also reduce fear of the unknown.

2. Encourage Internal Collaboration: AI adoption should not be left to the IT department alone. Cross-functional teams bringing together engineers, marketers and customer service staff will ensure that solutions address real business needs.

3. Strengthen Data Governance: AI systems are only as good as the data they rely on. Telecom companies should create clear policies around data quality, security and privacy. Introducing standardized ways of collecting and labelling data will help reduce errors and boosts trust in AI-driven insights.

4. Start Small, Then Scale: Rather than launching large-scale AI projects immediately, companies should begin with targeted pilots. This reduces risk while building organizational confidence.

B. For the Regulator (ZICTA)

1. Develop Clear AI Guidelines: To ensure responsible use of AI, the regulator should publish national standards covering data ethics, transparency and accountability. This helps both businesses and consumers feel secure that AI will be used fairly.

2. Provide Incentives for Adoption: Financial barriers remain a major challenge, especially for small and medium-sized telecom firms. Offering grants, tax breaks, or subsidies can help these companies experiment with AI tools without the fear of huge upfront costs.

3. Expand Digital Infrastructure: AI requires strong digital foundations such as reliable broadband and affordable cloud services. The regulator should necessitate expansion of these factors and other digital enablers to support AI scalability.

4. Raise Public Awareness: Beyond the companies themselves, the public also needs to understand what AI can (and cannot) do. National campaigns through radio, TV and social media can help demystify AI. Community workshops or university and industry partnerships can further bridge the knowledge gap.

CONCLUSION

To sum it all, adoption of AI in the telecom sector is not just about plugging in new software, it's about addressing human concerns, preparing organizations at multiple levels and demonstrating real, tangible benefits.

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