



Tailoring Safety Practices for AI Innovation: A Model for Nigeria's Socioeconomic Context

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KEYWORDS

Artificial Intelligence,
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Technical,
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ABSTRACT

Artificial Intelligence (AI) is rapidly transforming industries and societies worldwide. However, its adoption in Nigeria poses unique challenges and opportunities due to the country's socioeconomic context. This paper explores the development of safety practices tailored to Nigeria's distinctive characteristics. A quantitative method was used. A questionnaire was first used to understand the awareness, implementation and challenges of using Artificial Intelligence (AI) safely in a work environment. A Comparative Framework Analysis examining successful AI safety models from other regions was then conducted to extract adaptable strategies. The results suggest that while there is significant awareness and adoption of AI safety practices, there are still notable challenges, particularly in the areas of resources, training, and implementation. The high prevalence of AI-related safety incidents and the lack of confidence in organizations' abilities to handle these risks point to gaps in the existing safety frameworks. A framework with multidisciplinary approach to AI safety in Nigeria was then proposed. It offers a promising solution by integrating technical, regulatory, and sociocultural perspectives. It is recommended that efforts should focus on improving awareness, enhancing training programs, and ensuring that AI safety guidelines are both accessible and adaptable to local contexts.

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INTRODUCTION

Artificial Intelligence (AI) has emerged as a transformative technology with applications across various sectors in Nigeria, including healthcare, agriculture, and finance (Mohammed & Shehu, 2023; Akinpelu & Akintola, 2023). However, its deployment faces significant challenges, such as algorithmic bias, privacy concerns, and ethical implications (Salami & Nwankwo, 2024; Akinpelu & Akintola, 2023). State-of-the-art artificial intelligence (AI) models from Alibaba, Google, Meta, Microsoft, Mistral AI, and OpenAI have come under recent scrutiny for allegedly

"cheating". (Greene, 2025). While existing Nigerian legal frameworks prohibit discrimination generally, they do not adequately address AI-specific issues like algorithmic bias (Akinpelu & Akintola, 2023). The current privacy and data protection laws also fall short in addressing the unique challenges posed by AI systems (Salami & Nwankwo, 2024). To mitigate these risks, researchers recommend developing new legal and governance structures (Akinpelu & Akintola, 2023), implementing Explainable AI (XAI) techniques (Mohammed & Shehu, 2023), and establishing stringent requirements for AI tool provision and utilization

(Akindele & Adewuyi, 2023). Additionally, intensifying collaborations with relevant stakeholders is crucial for creating a robust AI governance system in Nigeria (Akindele & Adewuyi, 2023).

AI adoption in Nigeria is gaining momentum across various sectors, including supply chain management, manufacturing, and public services. Key drivers of AI implementation include senior management support, technological infrastructure, and regulatory frameworks (Hassan, 2024). In the manufacturing industry, AI adoption has shown positive impacts on operational efficiency, productivity, and competitiveness (Amaugo, 2024). However, challenges such as high implementation costs, insufficient skilled workforce, and infrastructural deficiencies persist (Amaugo, 2024; Nwosu et al., 2024). The public sector is in the early stages of AI adoption, with promising developments in e-governance, healthcare, and law enforcement (Nwosu et al., 2024). To fully harness AI's potential, Nigeria needs to invest in infrastructure, human capital development, and address ethical considerations like data privacy (Nwosu et al., 2024).

Recent research highlights the growing importance of AI governance and safety practices in Nigeria across various sectors. In healthcare, AI offers potential benefits for patient safety and occupational health, but raises concerns about algorithmic bias and privacy (Akinpelu & Akintola, 2023; Ukandu et al., 2023). The integration of AI in Nigerian journalism faces challenges such as infrastructural limitations and ethical considerations, while presenting opportunities for improved efficiency and innovation (Gbaden et al., 2024). Globally, AI governance frameworks emphasize risk categorization, ethical guidelines, and human safety considerations (Wodi, 2024). However, Nigeria's unique socioeconomic landscape requires further exploration of these principles' applicability. Common challenges include data quality issues, transparency concerns, and the need for robust ethical frameworks (Gbaden et al., 2024; Akinpelu & Akintola, 2023). Recommendations for Nigeria include investing in AI infrastructure, developing local expertise, fostering stakeholder collaboration, and establishing regulatory frameworks to ensure responsible AI deployment (Ukandu et al., 2023; Wodi, 2024).

The integration of AI in Nigeria and Sub-Saharan Africa presents both opportunities and challenges for socioeconomic development. AI-enhanced strategies can

promote economic resilience and inclusive growth by synergizing local knowledge with technological insights (Dada et al., 2024). In occupational health and safety, AI offers promising solutions for hazard identification and risk mitigation, though infrastructure limitations and skill gaps pose adoption challenges (Ukandu et al., 2023). Concerns surrounding AI deployment include data governance, privacy, educational gaps, and socioeconomic impacts, particularly for vulnerable groups (Akpudo et al., 2024). To ensure AI builds rather than undermines socio-economic inclusion, policymakers must consider gender equity, cultural and linguistic diversity, and labor market shifts (Gwagwa et al., 2020). Addressing these challenges requires investment in AI infrastructure, capacity building, stakeholder collaboration, and establishing regulatory frameworks (Ukandu et al., 2023; Akpudo et al., 2024). By embracing AI responsibly, Nigeria and Sub-Saharan Africa can leverage technology to drive sustainable development and improve workplace safety.

This paper proposes an approach that blends technical safeguards with sociocultural and regulatory adaptations, ensuring equitable and ethical AI innovation.

MATERIALS AND METHODS

A quantitative method was used. A questionnaire was first used to understand the awareness, implementation and challenges of using Artificial Intelligence (AI) safely in a work environment. It had five sections (demography, awareness of AI safety practices, current AI safety practices, challenges and risks and feedback/recommendation). 30 questionnaires were distributed and 21 returned using a research assistant. A comparative Framework Analysis examining successful AI safety models from other regions was then conducted to extract adaptable strategies.

RESULTS AND DISCUSSION

Questionnaire Analysis

The demography shows that 80% of the respondents were males and 20% females. 79% were between the ages of 18-20 years and 21% between 21-30 years. This shows that the respondents were mainly youths that are technology inclined and energetic. 60% of the respondents have a BSc and 40% had SSCE, which shows that majority of the respondents were literate.

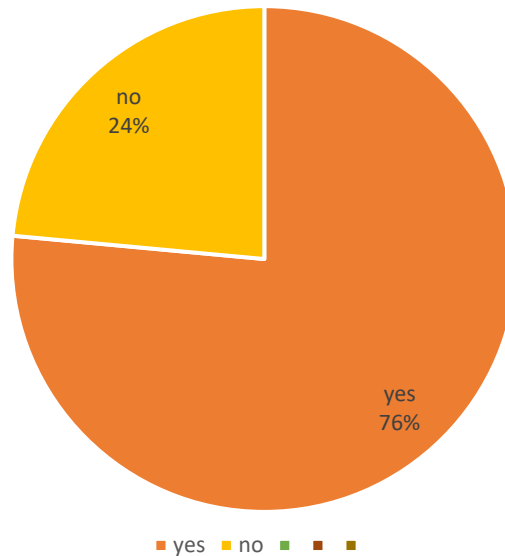


Figure 1: Are you familiar with the concept of AI safety

From figure 1, 76% of the respondents are familiar with the concept of AI safety while 24% were not. This shows that the majority of respondents (76%) are familiar with the concept of AI safety, indicating a strong awareness and understanding of the importance of managing risks

associated with AI systems. This high level of familiarity suggests that organizations and individuals are increasingly recognizing the need for responsible AI development and deployment.

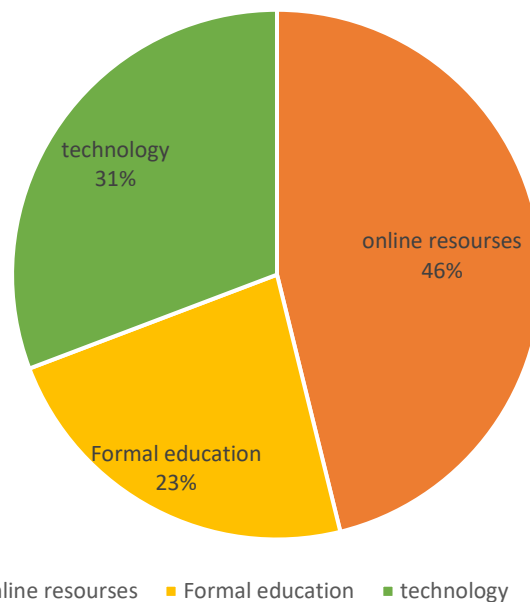


Figure 2: If yes, how did you learn about AI safety practices

From figure 2, 46% of the respondents learnt AI safety with online resources, 31% through technology while 23% through formal education. This shows that a significant portion of respondents (46%) learn about AI safety through online resources, indicating that digital platforms are a

popular and accessible means for acquiring knowledge on this topic. The 31% who learn through technology suggests a practical, hands-on approach to understanding AI safety, likely through tools, applications, or work experience.

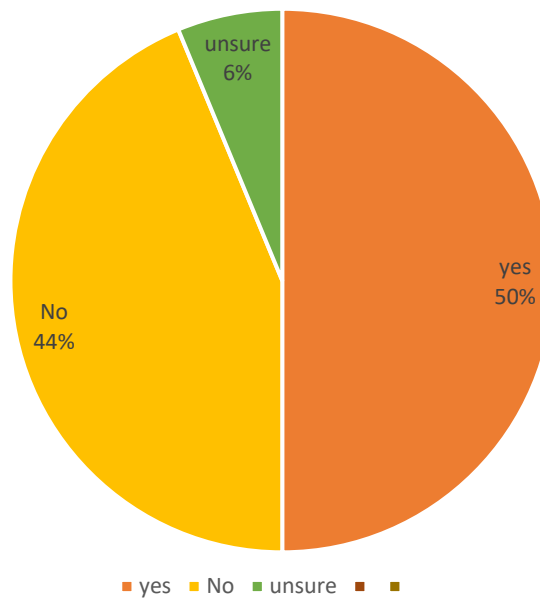


Figure 3: Are there existing AI safety guidelines in your workplace or community?

From figure 3, 44% of the respondents did not have AI safety guidelines in their workplaces or communities, 50% had while 6% were not sure. This shows that while a majority (50%) of respondents have AI safety guidelines in

place at their workplaces or communities, a significant portion (44%) still lacks these essential frameworks. The fact that 6% are unsure suggests some ambiguity or lack of clarity regarding AI safety governance.

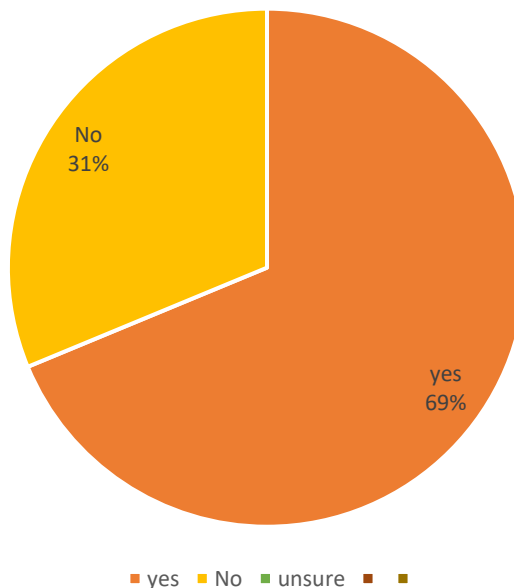


Figure 4: Do you currently implement AI safety practices in your work?

From figure 4, 69% of the respondents currently implement AI safety guidelines in their workplaces or communities, while 31% don't. This shows that the majority of respondents (69%) recognize the importance of AI safety and have taken steps to implement guidelines, suggesting

a positive shift toward responsible and ethical AI use. These organizations are likely prioritizing risk management, safety, and compliance in their AI applications.

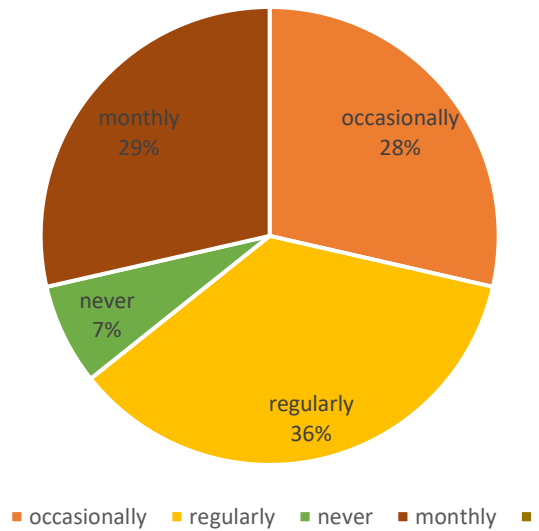


Figure 5: How often do you review or update your AI systems to ensure safety compliance?

From figure 5, 36% of the respondents review or update their AI systems to ensure safety compliance. 28% do it occasionally, 29% do it monthly and 7% never do it. This shows that while 36% of respondents demonstrate a

proactive approach by regularly reviewing or updating their AI systems to ensure safety compliance, a significant portion still lags in adopting consistent safety practices.

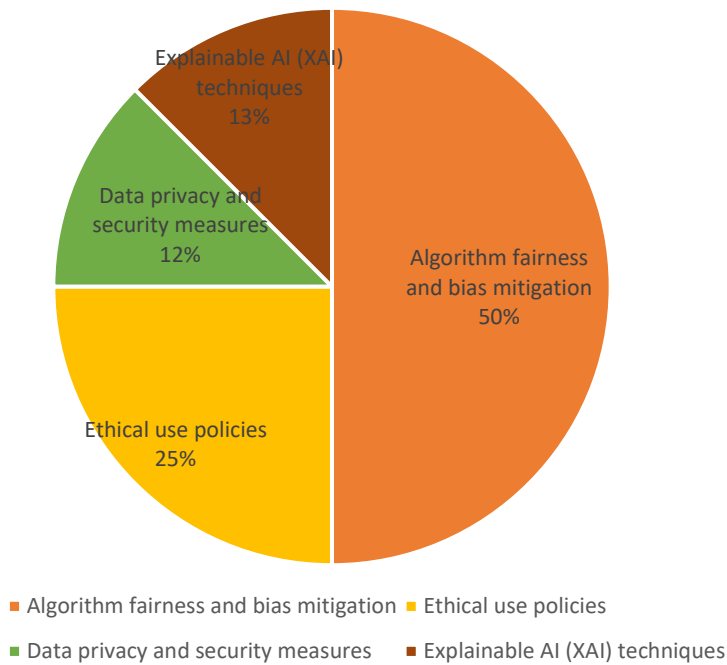


Figure 6: Which of the following AI safety practices do you use?

From Figure 6, 50% of the respondents use algorithm fairness and bias mitigation as their AI safety practice. 25% use ethical use policies, 12% use data privacy and security measures and 13% use explainable AI techniques. This shows that organizations prioritize algorithm fairness and

bias mitigation (50%) as the leading AI safety practice, reflecting a strong focus on ensuring equitable and non-discriminatory AI outcomes. This may be driven by growing industry and societal demands for fair AI systems.

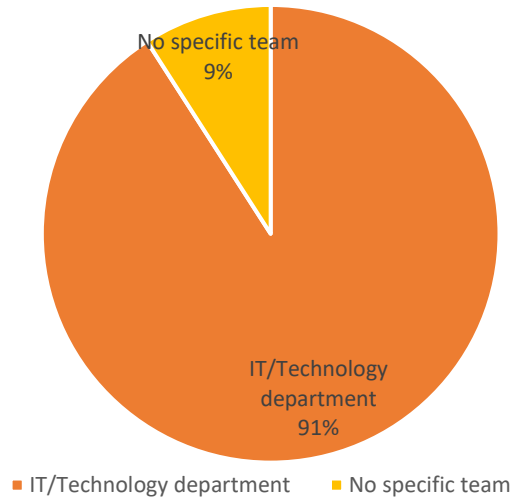


Figure 7: Who is responsible for AI safety in your organization?

From Figure 7, 91% of the respondents opined that IT/Technology department were responsible for AI safety in their organisations. However 9% did not have a specific team for AI safety. This shows that in most organizations, the responsibility for AI safety predominantly falls within

the IT/Technology department (91%). This highlights a strong reliance on technical teams for managing AI-related risks and safety measures, likely due to their expertise in handling technological systems.

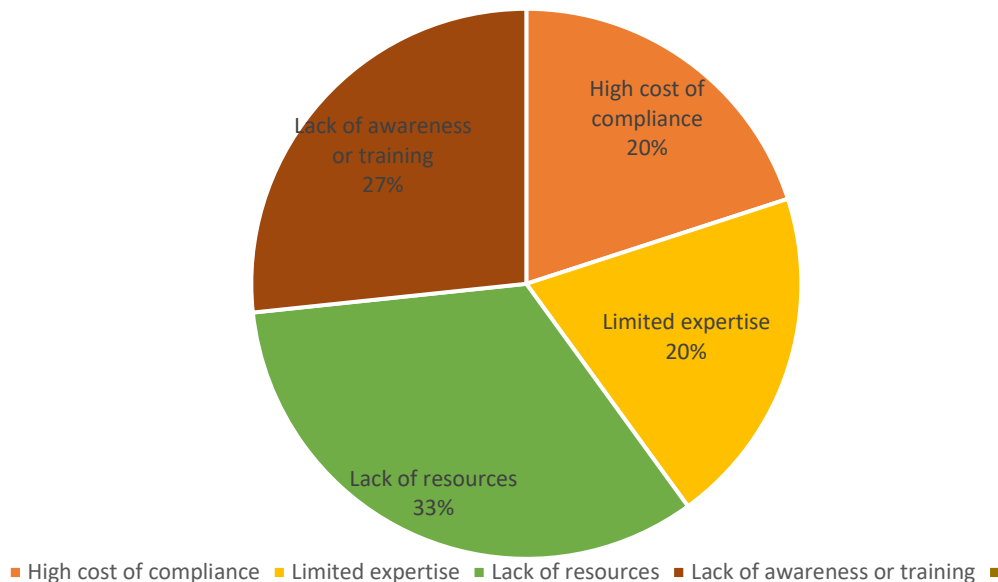


Figure 8: What challenges do you face in implementing AI safety practices?

From Figure 8, high cost of compliance(20%), limited expertise(20%), lack of resources (33%) and lack of awareness or training (27%) are the challenges facing implementation of AI safety practices. This shows that the implementation of AI safety practices faces a multifaceted

set of challenges, with the most significant being a lack of resources (33%) and a notable lack of awareness or training (27%). These findings suggest that resource constraints and insufficient knowledge remain critical barriers to adopting effective AI safety measures.

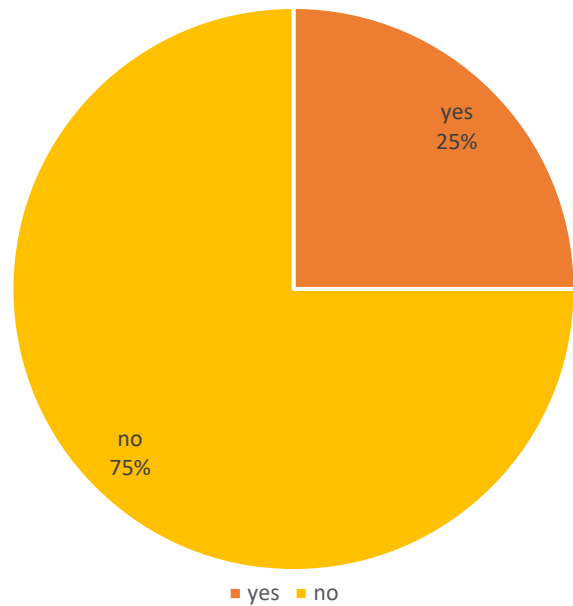


Figure 9: Have you encountered any safety incidents related to AI?

From Figure 9, 75% of the respondents had encountered safety incidents related to AI. A significant 25% have not experienced it. This shows that AI-related safety incidents are prevalent, with 75% of respondents reporting having

encountered such issues. This high percentage indicates that AI systems often present risks or challenges during deployment and operations, highlighting the pressing need for organizations to prioritize safety measures.

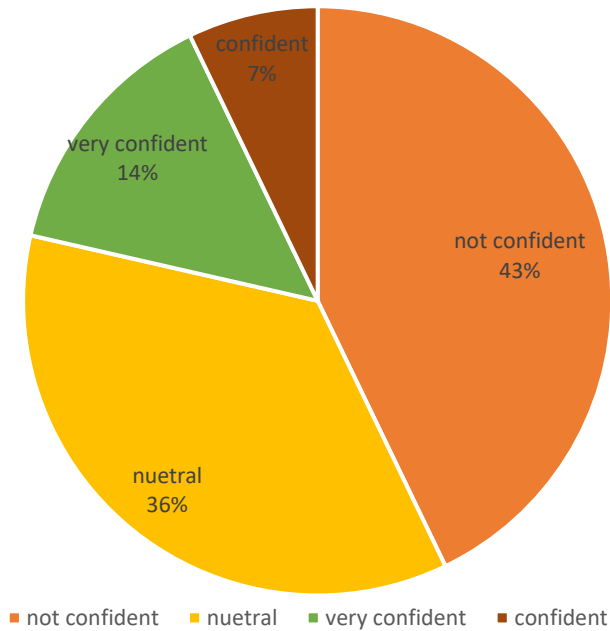


Figure 10: How confident are you in your organization’s ability to handle AI-related safety risks?

From Figure 10, 79% of the respondents were either not confident or neutral about their organization having the ability to handle AI related safety risks. While 21% were confident of their organisations ability. This shows that there is a significant lack of confidence among respondents regarding their organization's ability to handle

AI-related safety risks. With 79% being either not confident or neutral, it suggests that many organizations may lack the necessary expertise, resources, or structured frameworks to effectively manage and mitigate AI safety risks.



Figure 11: What type of incident occurred?

From Figure 11, unintended decisions or actions (50%) and discriminatory outcomes (50%) were the AI related risks experience in their organisations. This shows that respondents' organizations face a balanced and significant exposure to two major AI-related risks:

unintended decisions or actions (50%) and discriminatory outcomes (50%). The equal distribution of these risks highlights critical challenges in AI deployment, particularly regarding decision-making processes and fairness.

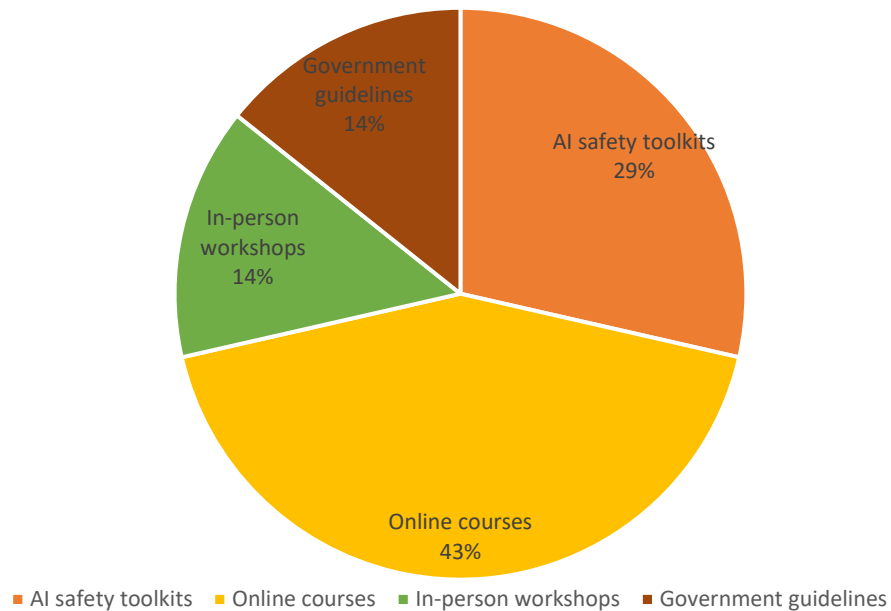


Figure 12: What kind of support or training would you find most beneficial for improving AI safety?

From Figure 12, the respondents considered online courses(43%), AI safety toolkits(29%), government guidelines(14%) and in-person workshops(14%) as the support the find most beneficial to improve AI safety. This shows that respondents predominantly value online courses (43%) as the most beneficial support for improving AI safety. The preference for online courses may suggest that respondents appreciate the flexibility, accessibility,

and breadth of information available through digital learning platforms.

Comparative Framework Analysis

Table 1 shows a review of existing AI Safety Model/ Practices. None had a combination of technical design principles, regulatory analysis, and sociocultural insights together.

Table 1: Existing AI Safety Model/ Practices

S/N	Author	AI Safety Model/ Practices	Key Components
1	Caburao (2024)	- Balance AI and human oversight - Train employees on responsible AI use - Ensure data privacy compliance - Focus on real-time applications - Start small and scale gradually	- technical, - regulatory
2	Ismail (2024)	- transparency - robustness - human-AI interaction - ethical considerations - regulation - collaborative approaches	- technical, - regulatory
3	Chen et al., (2018)	- Trustworthy AI - Responsible AI - Safe AI	- regulatory
4	McGrath (2024)	- Algorithmic bias detection and mitigation - Robustness testing and validation - Explainable AI (XAI) - Ethical AI frameworks - Human oversight - Security protocols - Industry-wide collaboration	- technical, - regulatory
5	AISI (2024)	- human-centric - safety - fairness - privacy protection - ensuring security - transparency - accountability - education/literacy - ensuring fair competition - innovation	- technical, - regulatory
6	Dalrymple et al., (2024)	- a world model - a safety specification - a verifier	- technical
7	SAIF (2025)	- Expand strong security foundations to the AI ecosystem - Extend detection and response to bring AI into an organization's threat universe - Automate defenses to keep pace with existing and new threats - Harmonize platform level controls to ensure consistent security across the organization - Adapt controls to adjust mitigations and create faster feedback loops for AI deployment - Contextualize AI system risks in surrounding business processes	- technical, - regulatory
8	OpenAI (2024)	- Empirical model red-teaming and testing before release - Alignment and safety research - Monitoring for abuse - Systematic approach for safety - Protecting children	- technical, - regulatory

- Election integrity
- Investment in impact assessment and policy analysis
- Security and access control measures
- Partnering with governments
- Safety decision making and Board oversight

Discussion

The results from the questionnaire and comparative framework analysis present significant insights into the current state of AI safety practices in Nigeria. The demographic information indicates that the majority of respondents are young, literate, and technologically inclined, which is reflective of a generation that is more likely to engage with digital technologies such as AI. This aligns with Börekci & Çelik (2024) that young, literate, and technologically inclined individuals are more likely to engage with AI technologies and that digital literacy plays a crucial role in university students' acceptance and intention to use AI tools in learning processes. This is important, as it suggests a workforce that is both receptive to learning and implementing AI safety practices.

From the questionnaire, a strong awareness of AI safety was observed, with 76% of respondents familiar with the concept. This aligns with Akinpelu & Akintola, (2023) who posited that, a growing awareness of AI in various sectors in Nigeria, including healthcare, libraries, and energy. This is a promising sign of increased recognition of AI safety's importance in today's technological landscape. The fact that most respondents learned about AI safety through online resources (46%) underscores the growing reliance on digital platforms for educational content. However, it also highlights the need for more formal educational avenues, given that only 23% learned about it through formal education.

Despite the awareness, challenges persist in implementing AI safety practices. A significant portion of respondents (44%) indicated the absence of AI safety guidelines in their workplaces or communities, and 33% pointed to a lack of resources as a key barrier. These findings indicate that while there is an understanding of AI safety, organizations and communities are struggling to

implement comprehensive safety measures due to resource constraints and limited access to proper training. This reason is slightly different from those cited by Manheim, (2023) who gave intangible risks, rapid advances, and lack of standardized practices as the reasons why Organizations struggle to build a safety culture for AI.

Furthermore, 75% of respondents reported encountering safety incidents related to AI, with unintended decisions or actions and discriminatory outcomes being the most common risks. This further highlights the need for effective frameworks and guidelines to mitigate these risks and improve AI safety in real-world applications. It is also concerning that 79% of respondents expressed low confidence in their organizations' ability to handle AI-related safety risks, suggesting that current safety mechanisms may not be robust enough to manage the evolving challenges posed by AI systems.

The comparative analysis of existing AI safety models revealed that none of the reviewed frameworks combined technical, regulatory, and sociocultural insights in a cohesive manner. This gap underscores the importance of developing a more holistic approach to AI safety, one that integrates all these dimensions for effective risk management. The proposed multidisciplinary approach, as detailed in Figure 13, presents a comprehensive framework for AI safety in Nigeria, combining technical safeguards such as algorithmic transparency, data privacy protocols, and bias mitigation, with regulatory interventions like localized standards and enforcement mechanisms. Additionally, the inclusion of sociocultural strategies such as community involvement and digital literacy campaigns highlights the need to consider local context in AI safety practices.

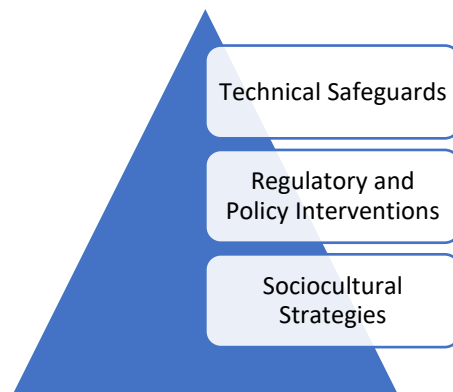


Figure 13: Proposed multidisciplinary approach to AI Safety in Nigeria

The Technical Safeguards involves Algorithmic Transparency. Data Privacy Protocols and Bias Mitigation. The Algorithmic Transparency Ensures AI systems provide explainable outputs. The Data Privacy Protocols Implements secure data storage and access practices tailored to local infrastructural capacities and the Bias Mitigation Develops context-aware models to minimize cultural or systemic biases. The Regulatory and Policy Interventions includes localized statement, enforcement mechanism ad capacity building for regulators. Localized Standards Adopts AI safety guidelines that reflect Nigeria's regulatory capacity and sociocultural dynamics. Enforcement mechanisms Strengthens institutional frameworks to monitor and enforce compliance. Capacity Building for Regulators entails training policymakers and regulators in AI technologies and ethics. Also, Sociocultural Strategies involves community inclusion, digital literacy campaigns and ethical framework. Community Inclusion entails Involving local communities in AI design and deployment to ensure cultural alignment. Digital Literacy Campaigns involves Promoting awareness and understanding of AI technologies among the general population. Ethical framework collaborates with cultural and religious institutions to align AI practices with societal values.

CONCLUSION

The findings of this study suggest that while there is significant awareness and adoption of AI safety practices, there are still notable challenges, particularly in the areas of resources, training, and implementation. The high prevalence of AI-related safety incidents and the lack of confidence in organizations' abilities to handle these risks point to gaps in the existing safety frameworks. The proposed multidisciplinary approach to AI safety in Nigeria offers a promising solution by integrating technical, regulatory, and sociocultural perspectives. This approach can provide a more holistic and context-sensitive framework for addressing AI safety challenges, ensuring that AI systems are not only technically sound but also aligned with local values, regulations, and societal needs. It is recommended that efforts should focus on improving awareness, enhancing training programs, and ensuring that AI safety guidelines are both accessible and adaptable to local contexts.

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Evaluating AI Safety Practices

Dear Participant,

This survey seeks to understand the awareness, implementation, and challenges of using Artificial Intelligence (AI) safely in your environment. Your responses will contribute to improving AI safety practices tailored to Nigeria. Participation is voluntary, and all information provided will remain confidential.

Section 1: Demographics

1. Sex: Male ☐ Female ☐
2. Age: _____
3. Education Level: Primary school ☐ SSCE ☐ BSc ☐ MSc ☐ PhD ☐ None ☐
4. **Occupation:** _____
5. **Industry:** ☐ Technology ☐ Healthcare ☐ Finance ☐ Education ☐ Agriculture ☐ Other (Specify) _____
6. **Location:** (e.g., City/Town, State) _____

Section 2: Awareness of AI Safety Practices

7. Are you familiar with the concept of AI safety? ☐ Yes ☐ No
8. If yes, how did you learn about AI safety practices? (Check all that apply) ☐ Online resources ☐ Formal education ☐ Training programs ☐ Workplace initiatives ☐ Other (Specify) _____
9. Are there existing AI safety guidelines in your workplace or community? ☐ Yes ☐ No ☐ Unsure

Section 3: Current AI Safety Practices

10. Do you currently implement AI safety practices in your work? ☐ Yes ☐ No
11. If yes, which of the following AI safety practices do you use? (Check all that apply) ☐ Data privacy and security measures ☐ Algorithm fairness and bias mitigation ☐ Explainable AI (XAI) techniques ☐ Regular model audits and updates ☐ Ethical use policies ☐ Other (Specify) _____
12. How often do you review or update your AI systems to ensure safety compliance? ☐ Regularly (e.g., monthly) ☐ Occasionally (e.g., yearly) ☐ Rarely ☐ Never
13. Who is responsible for AI safety in your organization? ☐ Dedicated AI ethics team ☐ IT/Technology department ☐ External consultants ☐ No specific team ☐ Other (Specify) _____

Section 4: Challenges and Risks

14. What challenges do you face in implementing AI safety practices? (Check all that apply) ☐ Lack of resources ☐ Limited expertise ☐ High cost of compliance ☐ Lack of awareness or training ☐ Other (Specify) _____
15. Have you encountered any safety incidents related to AI? ☐ Yes ☐ No
16. If yes, what type of incident occurred? ☐ Data breach ☐ Discriminatory outcomes ☐ Unintended decisions or actions ☐ Other (Specify) _____

Section 5: Feedback and Recommendations

17. What improvements would help ensure safer AI practices in your environment? (Open-ended) _____

18. On a scale of 1–5, how confident are you in your organization’s ability to handle AI-related safety risks? ☐ 1 (Not confident) ☐ 2 ☐ 3 (Neutral) ☐ 4 ☐ 5 (Very confident)
19. What kind of support or training would you find most beneficial for improving AI safety? ☐ Online courses ☐ In-person workshops ☐ AI safety toolkits ☐ Government guidelines ☐ Other (Specify) _____
20. Do you have any additional comments or suggestions regarding AI safety practices? (Open-ended)
- _____