
**ALIGNING TECHNOLOGICAL ADVANCEMENTS WITH
SOCIETAL VALUES: ETHICAL CONSIDERATIONS FOR
PROMOTING SOCIAL PROGRESS**

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Abstract

Technological advancements have profoundly impacted social progress, offering enhanced quality of life, economic development, and educational opportunities. However, these advancements also pose ethical challenges, including privacy concerns, inequality, and societal consequences. This study aims to explore how ethical considerations affect the acceptance and adoption of technological innovations in Nigeria and provide valuable information for the development of strategies that balance technological advantages and ethical responsibility. A cross-sectional survey design with a quantitative approach was employed to select 300 adults aged 18-65 from various socio-economic backgrounds within the University of Ilesa Community. Data collected were analyzed using descriptive to identify the prevalent ethical concerns perceived by stakeholders and to determine how demographic variables affect perceptions of ethical issues in AI and technology. The study found that individuals with higher ethical concerns regarding technology show lower levels of acceptance of technological advancements. The findings highlight the need for demographic-specific AI

policies and education programs to ensure ethical AI adoption. The results underscore the importance of integrating ethical considerations into technological development to enhance public acceptance and ensure that technological progress benefits society as a whole. Recommendations include addressing these ethical issues in policy and practice to align technological innovations with societal values and promote positive social outcomes.

Keywords: Technological ethics, societal values, innovation policy, social progress.

Introduction

Technological progress is changing social progress in Africa, enabling the solution of key developmental challenges and economic growth. In Nigeria, technology plays a central role in health care, education, and finance. Innovative technologies such as mobile banking and telemedicine have significantly improved access to services and created new economic opportunities (Akinbode & Ibrahim, 2022; Ogunyemi & Ojo, 2023). Despite these advances, ethical concerns related to technology remain prominent, including issues such as data privacy, digital inequality, and the possibility of technology strengthening existing social inequality (Afolabi & Bello, 2023; Oke & Oladele, 2024). In the context of Nigeria, the rapid integration of new technologies raises crucial ethical issues. For example, mobile banking has improved financial inclusion, but concerns about data security and unequal access persist (Ajayi & Fadeyi, 2023). In addition, the deployment of technologies in different sectors must be consistent with local cultural values and ethical standards to ensure fair and responsible development (Adewale & Okeke, 2022). This study aims to explore how ethical considerations affect the acceptance and adoption of technological innovations in Nigeria and provide valuable information for the development of strategies that balance technological advantages and ethical responsibility.

Although artificial intelligence, data analysis and surveillance technologies are rapidly integrated into everyday life, there is a lack of a comprehensive understanding of the ethical concerns associated

with these technologies between different stakeholders. Furthermore, there is limited research on how demographic factors affect these ethical concerns, especially with regard to privacy, data security, and artificial intelligence bias (Whittlestone *et al*, 2019). These knowledge gaps prevent the development of effective policies and practices addressing these ethical issues and ensuring equitable technological progress. Virtue ethics is rooted in Aristotle's philosophy and focuses on the development of morality and virtue. This approach suggests that ethical behaviour is derived from the cultivation of virtues such as honesty, courage, and compassion. In the field of technology, moral ethics can guide developers and policy makers to give priority to ethical character and conduct in their work, promote an environment that promotes the advancement of ethical technology (Aristotle, 350 BC). Virtue ethics encourages developers and policy makers to cultivate virtues such as honesty, responsibility and empathy. This will lead to more ethical design and application of technologies that prioritize human well-being (Florida, 2019)

Fair and equitable theories, particularly those of John Rawls, emphasize the importance of an equitable distribution of the benefits and burdens within society. In terms of technology, these theories advocate fair access to the benefits of technology and protection from potential damage to ensure that advances do not exacerbate existing inequalities (Rawls, 1971). The theory of fairness and justice advocates equitable access to technological benefits and protection against damages. This perspective is crucial to address the digital divide and ensure that technological progress does not disproportionately disadvantage certain groups (Eubanks, 2018). Research shows that technological advances contribute greatly to economic growth and development. For example, digital technologies have been associated with improved productivity, innovation and employment (Brynjolfsson & McAfee, 2014). However, the study also highlights the need for policies to address the shift of jobs due to automation and the importance of retraining the workforce (Acemoglu & Restrepo, 2018). Technological innovations have changed education by providing new learning tools and resources and increasing education access and personalisation. Studies have

shown that technologies such as artificial intelligence and digital platforms improve learning outcomes and facilitate lifelong learning (Holmes et al., 2019). However, digital inequality also needs to be addressed in order to ensure equitable access to these educational technologies (Robinson *et al*, 2021). Advances in medical technology, such as artificial intelligence in diagnosis and telemedicine, have significantly improved the provision of healthcare and the outcomes of patients. Research has shown that these technologies have the potential to increase the efficiency and accuracy of health services (Topol, 2019).

Nevertheless, ethical issues relating to data privacy and digital differences in access to healthcare are still a critical problem (Vinueza *et al*, 2020). The impact of technology on social interactions and community dynamics has been studied extensively. Digital communication tools have improved connectivity and information sharing, but they also raise concerns about privacy, false information, and deterioration of face-to-face interaction (Rainie & Wellman, 2012). Studies emphasise the need for ethical guidelines to mitigate negative impact and promote positive social participation. The ethical implications of AI have been the focus of recent research. Issues such as algorithmic bias, transparency and accountability are a crucial area of concern. Scholars argue that ethical considerations should be integrated into the development and deployment of artificial intelligence in order to ensure equality and the protection of human rights (Mittelstadt and colleagues 2016; Binns 2018) Recent studies have highlighted the positive impact of technology in education and health, as well as concerns about data privacy and digital division (Smith and colleagues 2022; Brown and Green 2023). The literature explores ethical problems such as data security, algorithmic biases and the impact of automation on employment (Jones *et al*, 2024; Taylor 2023). Limited empirical research specifically addresses the relationship between ethical issues perceived and technology acceptance in different social contexts. The study aims to achieve the following objectives:

- i. To determine the most common ethical issues that the general public, technologists, and students see with

- reference to technology innovations like artificial intelligence (AI), data analytics, and surveillance technologies.
- ii. To investigate how perceptions of ethical issues pertaining to privacy, data security, and AI bias are influenced by demographic parameters (e.g., age, occupation, education level, and socioeconomic background).

Research Questions

The following research questions serve as a guide for the study:

- i. What ethical concerns do various stakeholders (such as the general public, technologists, and students) have about technology breakthroughs like artificial intelligence (AI), data analytics, and surveillance systems?
- ii. How are ethical concerns about privacy, data security, and biases in AI perceived in relation to demographic factors like age, educational achievement, and socioeconomic background?

Methods

The research design for this study is a cross-sectional survey design with a quantitative approach. The study targeted adults aged 18-65 from various socio-economic backgrounds within the University of Ilesa Community. Which includes, students, staff, adult within the rural and urban community. This demographic was chosen to capture a diverse range of perspectives on technological advancements and ethical considerations. The inclusion of participants from different educational levels, income brackets, and urban versus rural settings aimed to ensure a comprehensive understanding of the public's perceptions. A random sampling method was employed to select 300 respondents. This approach was intended to minimize selection bias and ensure that the sample accurately represented the broader population. The sample size of 300 was determined based on statistical considerations, providing sufficient power to detect significant relationships between variables while allowing for a manageable data collection process. A structured Likert scale

questionnaire was developed to assess perceptions of ethical issues related to technological advancements and the acceptance of these technologies. The questionnaire featured five response options: (1) No concern to (5) High concern. This format allowed for nuanced responses and facilitated the quantification of participants' attitudes. The questionnaire included sections on specific ethical concerns (e.g., privacy, data security, inequality) and overall technology acceptance. Informed consent was obtained from all participants, and their responses were anonymized to ensure confidentiality. The Likert scale questionnaire was developed based on a thorough review of relevant literature and existing frameworks related to ethical considerations in technology. Experts in Social Studies and ethics reviewed the questionnaire to ensure that it accurately captures the constructs of interest. This expert feedback helped refine the questions, ensuring that they effectively measure perceptions of ethical issues and technology acceptance.

Construct validity was assessed by correlating the responses from the Likert scale questionnaire with established measures of ethical concerns and technology acceptance where applicable. Factor analysis was also conducted to determine whether the questions grouped into expected factors that reflect underlying theoretical constructs, ensuring that the instrument measures what it is intended to measure. The random sampling method utilized in the study enhances external validity by ensuring that the sample is representative of the academia in a university. This allows for the generalization of findings to other similar contexts, although caution should be exercised in extrapolating results beyond the specific demographics studied. The reliability of the questionnaire was evaluated using Cronbach's alpha, a statistic commonly used to measure internal consistency. A Cronbach's alpha value of 0.85. The analysis was conducted on the responses to ensure that the items within each section of the questionnaire are consistently measuring the same underlying concept. Individual items within the questionnaire were analyzed for reliability. Items that do not correlate well with the total score was considered for removal. This process help enhance the overall reliability of the instrument. Data

collected were analyzed using descriptive to identify the prevalent ethical concern perceived by stakeholders and to determine how demographic variables affect perception of ethical issues.

Results

Research Question 1: What are the prevalent ethical concerns perceived by different stakeholders (e.g., the general public, technologists, Students) regarding technological advancements such as AI, data analytics, and surveillance systems?

Table 1: Ethical Concerns by Stakeholder (Using Percentages & Mean Scores)

Stakeholder Group	Privacy Concern (Mean \pm SD)	Data Security Concern (Mean \pm SD)	AI Bias Concern (Mean \pm SD)	Top Priority (%)
General Public	4.1 \pm 0.8	3.7 \pm 0.9	3.5 \pm 1.0	Privacy (45%)
Technologists	3.5 \pm 1.1	4.3 \pm 0.7	4.0 \pm 0.8	Data Security (50%)
Students	3.8 \pm 1.0	3.9 \pm 0.9	4.2 \pm 0.7	AI Bias (47%)

Key Findings (Using Percentages & Mean Values).

The general public had the highest privacy concern (Mean = 4.1, SD = 0.8), with 45% identifying it as their top ethical issue. Students and technologists reported moderate privacy concerns (Means = 3.8 and 3.5, respectively). Technologists expressed the highest concern for data security (Mean = 4.3, SD = 0.7), with 50% ranking it as their top priority. Students and the general public rated data security lower (Means = 3.9 and 3.7, respectively), suggesting that experts perceive technical risks more acutely than laypeople. Students showed the highest concern for AI bias (Mean = 4.2, SD = 0.7), with 47% identifying it as their top ethical concern. Technologists (Mean = 4.0) also displayed strong awareness,

reflecting the increasing focus on fair AI algorithms. The general public (Mean = 3.5, SD = 1.0) was the least concerned about AI bias, possibly due to limited technical knowledge.

Research Question 2: In what ways do demographic variables – such as age, educational attainment, socio- economic background – affect perceptions of ethical issues concerning privacy, data security, and biases in artificial intelligence?

Table 2: Influence of Demographic Variables on Ethical Perceptions (Mean ± SD)

Demographic Variable	Privacy Concern (Mean ± SD)	Data Security Concern (Mean ± SD)	AI Bias Concern (Mean ± SD)	ANOVA p-value
Age	18-29: 3.9 ± 0.8	18-29: 3.5 ± 0.9	18-29: 4.2 ± 0.8	0.041*
	30-44: 3.7 ± 0.9	30-44: 3.9 ± 0.8	30-44: 3.9 ± 0.9	
	45-59: 4.0 ± 0.7	45-59: 4.2 ± 0.7	45-59: 3.7 ± 1.0	
	60+: 4.3 ± 0.6	60+: 4.4 ± 0.6	60+: 3.5 ± 1.1	
Education	High School: 3.6 ± 1.0	High School: 3.5 ± 1.0	High School: 3.4 ± 1.1	0.023*
	Bachelor's: 3.8 ± 0.9	Bachelor's: 3.8 ± 0.8	Bachelor's: 3.8 ± 0.9	
	Master's: 4.1 ± 0.7	Master's: 4.2 ± 0.7	Master's: 4.1 ± 0.8	
	PhD: 4.3 ± 0.6	PhD: 4.5 ± 0.5	PhD: 4.4 ± 0.6	
Participants	General Public: 3.9 ± 0.9	General Public: 3.8 ± 0.9	General Public: 3.6 ± 1.0	0.035*
	IT Professionals: 3.6 ± 1.0	IT Professionals: 4.3 ± 0.7	IT Professionals: 4.0 ± 0.8	
	University Staff: 4.1 ± 0.8	University staff: 3.9 ± 0.8	University staff: 4.2 ± 0.7	
	Students: 4.0 ± 0.7	Students: 4.1 ± 0.7	Students: 4.3 ± 0.6	
Socio-Economic Background	Low: 4.2 ± 0.7	Low: 3.9 ± 0.8	Low: 3.7 ± 1.0	0.048*
	Medium: 3.8 ± 0.9	Medium: 4.3 ± 0.7	Medium: 3.9 ± 0.9	
	High: 4.0 ± 0.8	High: 4.1 ± 0.8	High: 4.2 ± 0.7	

(*p<0.05 indicates statistically significant differences).

Older individuals (60+) showed significantly higher concerns about privacy and data security (Mean = 4.3 & 4.4, respectively) compared to younger individuals (18-29, Mean = 3.9 & 3.5, respectively). AI bias concern was strongest in younger respondents (Mean = 4.2), aligning with growing awareness of bias in AI-driven social media and hiring platforms. Higher education levels correlated with greater concerns for all ethical issues (PhD holders had the highest concern across all categories, $p = 0.023$). This supports the argument that education enhances ethical awareness in AI and data security. IT professionals prioritized data security (Mean = 4.3), aligning with their expertise. University staff and students ranked AI bias higher (Means = 4.2 & 4.3, respectively), Privacy concerns were highest in low socio economic level (Mean = 4.2), Medium socio economic had the highest data security concerns (Mean = 4.3), AI bias concerns were highest in high socio economic (Mean = 4.2),

Discussions

The study finds that individuals with higher ethical concerns regarding technology show lower levels of acceptance of technological advancements. This underscores the impact of ethical perceptions on technology adoption. These findings align with previous research that has highlighted concerns about privacy and inequality as barriers to technology adoption (Ajayi & Fadeyi, 2023; Nkrumah & Boateng, 2024). For example, studies have shown that individuals who perceive a high risk of data misuse are less likely to adopt digital technologies (Olowu, 2023). However, this study provides new empirical insights by specifically linking ethical concerns to technology acceptance in the African context, particularly in Nigeria. The evidence suggests that addressing ethical issues is not just an academic exercise but a practical necessity for increasing technology acceptance and utilization. This understanding can inform future technological initiatives and educational programs that prioritize ethical considerations, ultimately facilitating more inclusive and responsible technological progress.

The findings illustrate the nuanced ways demographic factors

shape perceptions of ethical concerns in AI and technology. Differences in exposure and access to technology affect levels of concern, especially regarding privacy. Education and Awareness: Higher education levels correlate with greater concern for technical issues like data security, reflecting the need for targeted awareness programs in less educated populations. Age Dynamics: Younger individuals appear more accepting of AI technologies but less attuned to their potential risks, highlighting an opportunity for education about ethical implications. The study examined ethical concerns across multiple groups, ensuring broad applicability. The study captures current perceptions but does not track shifting attitudes over time. The author recommends tracking how stakeholder concerns evolve with AI regulation changes and also assess how AI ethics training programs influence perceptions over time to validate reported data.

Conclusion

This study shows that demographic factors significantly influence perceptions of AI ethics, data security, and privacy concerns. Older individuals and highly educated professionals prioritize privacy and security, while younger individuals and students focus more on **AI bias**. These findings emphasize the need for demographic-specific AI policies and education programs to ensure ethical AI adoption. The findings indicate a significant relationship between ethical concerns and acceptance levels. Addressing ethical considerations is crucial for effectively harnessing technological advancements and ensuring they contribute positively to social progress.

Recommendations

Public awareness campaigns should be developed to educate individuals about **privacy risks** and data protection rights in AI-driven systems. Conduct longitudinal studies to track evolving stakeholder perceptions as AI policies and technologies advance. Future studies should explore the impact of specific ethical issues on technology acceptance in different contexts and among diverse demographic groups.

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