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Ethical Considerations in Advanced Automation

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Abstract
This paper examines the ethical aspect of advanced automation, focusing on the most essential issues, analyzing the sufficiency of the existing ethics, as well as outlining practical solutions to reduce the risks posed by artificial intelligence and automation. The cross-sectional survey design was adopted, and the questionnaires have been structured and issued to 333 respondents. All data were analyzed with the help of SPSS version 27 through descriptive statistics and the t-test of one sample to verify the identified hypotheses. The results showed that a large proportion of the respondents found highly automated systems to create serious ethical concerns namely; job displacement, economic inequality, algorithmic discrimination, and lack of transparency. Descriptive outcomes also showed that there is a general agreement that current ethical and legal systems are failing to keep up with the fast development of automation. At the significance level of p 0.05, all the three null hypotheses were rejected. The respondents affirmed that automation has a significant effect on employment, that artificial intelligence systems may discriminate against specific groups of people due to embedded bias, and that responsible and transparent AI can actually decrease ethical risks. The results highly indicate the need to have stronger governance models, such as binding codes of ethics, increased transparency, and more frequent participation of regular citizens in the process of AI policy-making. It is concluded in the paper that the ethical oversight should be managed in stages along with technological advancement such that automation is put in place in a way that is not only fair but also responsible. The suggested solutions include regulatory changes, special ethical educating of developers, frequent audits, and expanded participation of the community in the regulation of AI. Although the research is limited with its cross-sectional design, application of self-reported data, and narrow sector-specific analysis, it offers a significant baseline of future research and policy campaigns that would achieve the right level of technological development at the authoritative level of ethical and social ethics.

Keywords: Ethics, Consideration, Advanced, Automation, Risk

Introduction

Strong automation, with its driver of artificial intelligence (AI), robotization, and machine learning, has significantly changed industries, healthcare, transportation, and normal life (Wang et al., 2022). Automation has increased efficiency in the operation and minimized the human error effect as well as cost reduction hence has become a groundbreaking agent in modern society (Bokhari & Myeong, 2022). However, it has already become widely connected, leading to serious ethical issues, such as job loss, lack of transparency in decision-making, bias in AI systems, violation of privacy, and responsibility in autonomous systems (Memarian & Doleck, 2023). In the past, technological advancements have broken the labor markets, but developed automation has proven to cause special ethical dilemmas due to its ability to make independent decisions (DeGrazia, 2022). As an example, self-driving cars have to make life-threatening moral decisions within seconds, which is how it raises doubts as to how AI will prioritize human lives in an inevitable accident (Swierstra & Waelbers, 2012). Similarly, AI-based recruitment systems, despite being more efficient in hiring, can contribute to discrimination through unintended actions in case they are trained to use discriminatory data (Pavarini et al., 2021). The increasing use of automated systems also triggers the apprehensions of human agency, monitoring, and moral accountability of developers and companies (Stahl et al., 2023).

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In recent years, the adoption of AI and robotics in various industries has increased rapidly and includes the use of the system in both medical diagnostics and autonomous trading (Gibelli et al., 2021). Robotic surgery systems discussed by Marcus et al. (2024) could be applied in the medical field in addition to the improvements in precision; however, similar to robots, these systems also present some ethical considerations that would involve the care of the surgeon and patient consent. At the same time, AI-based predictive analytics in medicine (Lv et al., 2022) can enhance patient outcomes, yet it will violate patient confidentiality in case of limited data security (Choudhury et al., 2022). The work place has also been subject to great change by automation. AI maximizes productivity, but at the same time, it replaces human labor, especially in the production and customer care (Carsten Stahl, 2021). This change has aggravated the economic inequality and led to the discussion of the universal basic income and reskilling of the workforce (Singh et al., 2022). Furthermore, artificial intelligence (AIs) used to hire and promote employees as examined by Mensah (2023) also embody biases in society that can disfavor the marginalized groups unless they encompass effective mechanisms of fairness. Among the most topical ethical imperatives of advanced automation erosion of privacy can be mentioned. Facial recognition and predictive policing as AI-powered surveillance technologies have led to concems about the mass data gathering and possible wrong use (Wu et al., 2024). As examined by Dwivedi et al. (2022), the metaverse poses new threats to privacy and builds the immersive virtual reality in which the actions of users are constantly observed. Likewise, AI chatbots like ChatGPT, which Sebastian (2023) is writing about, amass personal data in large volumes and thus there is need to have more stringent rules and regulations to prevent exploitation.

The consequences of this kind of data privacy are continued into the healthcare sector, where AI-powered diagnostics is provided based on the sensitive patient information (Sujith et al., 2022). Without a strong encryption and consent system, these systems will pose the risk of breaching medical confidentiality (Harfouche et al., 2021). The approach suggested by Federated learning (Federated Learning) by Choudhury et al. (2022) can be considered a possible solution as it allows the decentralization of the analysis of data without having access to the raw personal data. However, there is a critical issue of balancing the issues of innovation and privacy protection. Algorithms bias within the automated systems remains a widespread problem, particularly in the circumstances of law enforcement, lending, and employment (Mensah, 2023). The empirical evidence has shown that AI models built on past data commonly reproduce the already existing biases, which results in discrimination (Pavarini et al., 2021). To illustrate, predictive policing tools could disproportionately impact the minority communities in case they are trained on biased arrest history (Memarian & Doleck, 2023).

Reducing bias also includes machine learning based on fairness and diverse dataset maintenance (Al-kfairy et al., 2024). Patiently though, as Cherry (2023) argues, the development of AI ethically should also bring in philosophical and cultural viewpoint to be inclusive. Pavararini et al. (2021) introduce the concept of Design Bioethics that conditions the idea of interdisciplinary cooperation in the development of ethically appropriate automation technologies. One of the greatest ethical problems related to the further development of automation is the thought of finding responsibility in accordance with the failures of AI machines and their harmful effects (DeGrazia, 2022). As an example, in the case of a car accident that is causing the death of an autonomous vehicle owner, the decision about the person who is to be held liable: manufacturer, programmer, or user is still rather disputable. The existing laws also have difficulties in answering these questions, and it is possible to emphasize that the new rules are necessary (Stahl et al., 2023). Another vital aspect is transparency, since many AI systems have been designed as black boxes, and thus, matters of decision-making cannot be traced back (Wang et al., 2022). Explainable artificial intelligence (XAI) has become one of the possible solutions, allowing users to understand and challenge the decisions of automation (Wu et al., 2024). However, according to Durante (2023), to ensure real transparency, it is crucial not only to find technical solutions but also to observe ethics, which should provide human control.

In an attempt to address these issues, scholars have come up with a number of exertions on AI and automation ethical constructs. The FATE (Fairness, Accountability, Transparency, and Ethics) model, which Memarian & Doleck (2023) write about, gives a systematic method of assessing the AI systems. Similarly, the IDEAL surgical robotics framework (Marcus et al., 2024) also focuses on the long-term monitoring and ethics in the sphere of medical AI use.

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There are also religious and philosophical ways of contributing to the discourse. Cherry (2023) examines the Christian bioethics regarding AI stating that technological advancement should be led by ethical principles. At the same time, Swierstra & Waelbers (2012) offer a metric of assessing the social consequences of automation and understand how the introduction of AI control requires democratic regulating measures. The booming development of automation technologies, such as artificial intelligence (AI), robotics, and machine learning, have brought unparalleled efficiency in the diverse industries compared to lowering many important ethical concerns (Wang et al., 2022). Although such technologies have positive consequences, there are severe issues that are not sufficiently solved, thus being a threat to social equity, privacy, and accountability (Memarian & Doleck, 2023).

Job displacement is one of such acute problems since today millions of traditional jobs are under the threat of being automated, which can worsen economic inequality and demand the implementation of urgent reskilling programs of the workforce (Carsten Stahl, 2021). Despite the productivity of automation, its uncontrolled growth poses the threat of another vulnerable group of people being left without permanent jobs (Singh et al., 2022). Besides, AI-based decision-making tends to cause systematic discrimination especially in employment, law enforcement, and finance (Pavarini et al., 2021). It has been found that AI models that are developed on biased data strengthen current biases, and they generally favor the marginalized (Mensah, 2023). These biases may be perpetuated without remedial actions that may enhance divisions within the society. The other important issue is that AI systems lack transparency and thus may turn into black box and make the process of decision-making process unclear (Wu et al., 2024). This makes it challenging to appeal automated decisions particularly in situations where people face serious stakes like in healthcare and criminal justice (Durante, 2023). Moreover, the mass data collection, which is part of AI and IoT-based systems, is a cause of privacy violations, which sound ethical concerns (Sebastian, 2023). The emergence of surveillance software and generative AI products, like ChatGPT, increases the vulnerability of the unauthorized use of data (Wu et al., 2024). The possibility of an accountability gap in any autonomous system is, probably, one of the most disturbing issues (DeGrazia, 2022). In cases of harm caused by AI, be it medical malpractice, AMV, or malfunctions of financial systems, legal systems have a hard time determining who should be responsible (Stahl et al., 2023). The current laws are not abreast with current technological innovations, and therefore, victims have no definite option. These problems are intensified by the lack of an elaborate set of ethical principles and binding policies (Al-kfairy et al., 2024). Although such frameworks as FATE (Fairness, Accountability, Transparency, and Ethics), have been offered (Memarian & Doleck, 2023), their practice does not exist regularly. This research aims to cover these gaps by evaluating the ethical risks of automation and developing solutions to be implemented by the policymakers, developers, and overall stakeholders. Unless action is taken, the unregulated development of AI and automation has a chance to fix the existing inequality and destabilize privacy and public confidence regarding technology (Dwivedi et al., 2022).

Advanced Automation

Advanced automation means incorporation of advanced technological systems to do work with the least human interference. Historically, the concept of automation included the repetitive or structured tasks that could be performed by machines; nevertheless, the advent of artificial intelligence, robotics, and machine learning significantly changed the concept. Stahl et. al. (2023) opine that the technologies are more efficiently synthesised through advanced automation that creates efficiency, effective decision-making, and reduced errors in industries like manufacturing, healthcare, finance and transport sector. This means that it is not only possible through this integration to implement tasks but also to adjust and learn the environment, which enhances performance in the long run. Although there are a lot of benefits of advanced automation, it goes without criticism. Another argument that DeGrazia (2022) makes is that excessive use of automated systems can undermine the human control and the ability to make moral decisions. With machines taking up such important duties of making decisions, it would mean that human operators are weighted by the prospects of being excessively reliant thus, might cause oversight of ethics or deliberate loss of critical thinking areas. To give an example, the low role of human intervention in life-and-death situations like self-driving vehicles or x-ray surgery may have life-threatening outcomes, in the event of a system malfunction or an unforeseen action. The knowledge of sophisticated automation is a key to the understanding of the overall course of technological development. It is a change to more intelligent and autonomous systems that can remodel the functioning of society and make processes quicker, more precise, and in many cases, more economical (Memarian & Doleck, 2023). However, implementation of such technologies often ignores the huge socio-economic consequences especially in the developing nations. According to Kalenzi (2022), there might be a lack of structures or that it might be lacking in policy infrastructures of these areas to fully exploit the potential of automation, a factor that increases inequality in the world.

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The analysis of the existing literature shows that most of the current studies on artificial intelligence and automation focus on technical solutions, i.e., optimisation of algorithms, data security, and efficiency of models at the cost of examining more socio-economic implications. As an example, Singh et al. (2022) support the idea of shifting beyond the concept of technological determinism in an attempt to analyze the relationship between automation and employment, income distribution, and social equity. Such a technical interest limits the ability of available research to understand the full role of AI in transforming societal forms especially in vulnerable groups who might be most susceptible to this change. Besides, the lack of comparative studies that determine the regulation of AI and automation by various countries and regions stands out. According to Duquenoy, (2023), the lack of these kinds of comparative frameworks constitutes the barrier to the assessment of the effect of the policy and adapting the best practices to the various jurisdictions. Such regulatory loophole hinders the formation of consistent international norms and undermines international cooperation in relation to the ethical regulation of the emerging technologies. Absent the comparative information, all the policymakers and technologists are forced to wade through ethical issues individually, further raising the chances of a fragmented and ineffective regulatory response. Finally, the views of Global South continue to be highly underrepresented in existing literature, which causes the imbalance in the ethical issues and concerns being prioritized. Kalenzi (2022) emphasizes that most of the research ignores cultural, infrastructural, and political variables in the developing world, where the role of automation could be a lot different as it is in richer areas. This paper fills these gaps by the analysis of ethical issues based on the policy design, equity, and cross-cultural ethics. It aims at generating a more comprehensive view of the ethical aspects of advanced automation by adding a variety of outlooks especially those of the underrepresented areas.

The Objectives of this work are:

i. Analyze the ethical issues raised by the progressive automation in different industries.
ii. Examine the current ethical theories and determine their suitability to automation.
iii. Guest policy and technical recommendations to make automation responsible.

The Research questions that will be the focus of the work are:

i. What do advanced automation have as the major ethical concerns?
ii. What are the ethical issues are current ethical frameworks dealing with in the context of automation?
iii. What are some of the measures that can be put in place in order to mitigate ethical risks in automation?

The following Research Hypotheses shall be engaged to enhance the study

i. Enhanced automation does not make a substantial change on the employment thus averting job displacement and inequality in the economy.
ii. Intelligent systems of decision making are not characterized by bias that is uneven to marginalized populations.
iii. Open and responsible AI systems do not lessen the ethical dangers of automation.

Methodology

This section outlines the research approaches that have been used to explore ethical aspects of advanced automation and in particular accountability, transparency, equity, and cross-cultural governance. Its implementation is based on the best practices in the research process of business and social science, relying on the theoretical and philosophical orientations that have been brought forth by Saunders, Lewis & Thornhill (2019), Creswell & Creswell (2018), and Bell (2022). This section presents the research design, target population, sampling strategy, instrumentation, data-collection procedures and the applicable analytical techniques. The research paper under consideration has a quantitative descriptive cross-sectional design of a survey. Quantitative designs enable the systematic data collection process and help use the statistical methods to provide the test of relation or difference between the variables. The descriptive design can be characterized as the most fitting type of investigation because it allows outlining and explaining ethical issues related to the advanced automation, including but not limited to accountability, invasion of privacy, and job loss, without any effort to manipulate any variable. The cross-sectional aspect of the study enables the collection of data at a single time, thus making them suitable in assessing the current ethical perceptions and practices in the institutions and organisations that have implemented automation. The survey method also allows storing standardised data of a wide and diverse population and, hence, makes it more possible to generalise the results. The reason is that the organized design also facilitates objective data gathering and the ensuing inferential statistics analysis.

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Population of the Study

The target population was composed of people who were working in any technology-oriented organisations, policymakers, academicians and practitioners working in fields where automation is common in Nigeria. This group was considered to be the right one due to the direct or indirect exposure of its members to such issues as automation, AI regulation, ethical conduct, and regulation. The overall number of people who constituted the available population of this study was 2,000, including engineers, data analysts, Tedfas and IT managers, compliance officers and ethics board members as part of different institutions. The popularity of this size of population could be explained by the topicality of professional engagement of respondents in AI and automation, their involvement in the organisational decision-making process, and their ability to shed light on the new ethical issues. Drew attention to the fact that the target population should correspond to the purpose of the research and be well able to provide data-rich responses, which is a requirement met by this group of respondents.

Sample and Sampling Procedure

A sampling means choosing a representative sample out of the entire population so that data gathering and broad applicable inferences become possible. The simple random sampling method was used in this research study and this is one of the probabilistic sampling methods that ensures that every member of the population has an equal chance of being randomly selected. This was done to avoid any selection bias, in addition to making the results reflective of the whole population. A sample size of 2,000 respondents in this study was the total population used to estimate the correct sample population based on the use of Taro Yamane formula that Beiske (2017) recommends in estimating sample sizes in finite populations. The functional size of the sample (n) is the result of the following formula:

$n = N/(1 + N e^2)$

where, n = sample size, N = population size and e = margin of error (0.05).

$n = 333$

The formula of the Taro Yamane was used to compute the sample size which was about 333 (rounded to the nearest whole number). This is where the sample of 333 respondents was adopted according to the current study.

Instrumentation

The researcher came up with a structured questionnaire based on the knowledge of the available literature and the previous empirical research carried out, based on which data were collected. The instrument consisted of two parts, Section A included demographic information, whereas Section B constituted Likert-scale questions in accordance with the research purpose, which was to investigate the concept of fairness, accountability, transparency, and job displacement in advanced automation. The choice of the direct method of administering the questionnaire was informed by its effectiveness in covering a large number of individuals who responded to the questions and its effectiveness in gathering quantifiable data. The questionnaires are especially useful when conducting descriptive surveys as it allows the respondents to respond anonymously and honestly on the sensitive ethical issues The instrument was developed according to the research goals and the applicable ethical constructs based on the empirical and theoretical research.

Validation of the Instrument

Content and face validation of the questionnaire was done by professionals in AI ethics, research methodology and survey design. Their comments led to the correcting of ambiguous or leading questions and were used to suit the conceptual framework of the study. Validation boosts instrument credibility and correct measures of the target constructs. Checks involved in the validation process were on linguistic clarity, logical coherence, item relevance and the appropriateness of the scale used. They were revised to produce better construct validity. As well, pilot test with 20 participants (not included in the sample final) was done. Applicability Pilot data determined subsequent improvements, which validated that the questionnaire was applicable in a full-sized use. The instrument is reliable based on its subjectivity and sensitivity to change (Rostron, 2018). Internal consistency was measured through the use of Cronbachs alpha calculated on pilot answers with the help of SPSS version 27. The alpha of Cronbach is an acceptable measure to test the reliability of Likert-scale tools (Tavakol & Dennick, 2021). The alpha value of 0.78 was found, and it surpasses the traditional amount of 0.70 and shows reliability (Bernard & Ryan, 2019). Each of the constructs, which included fairness, transparency, accountability, and job displacement, had been rated independently in order to guarantee that multi-item measures had similar response patterns. This test of reliability ensured that there was internal consistency of the questionnaire items thus this makes the items suitable to be analyzed through inferential statistics.

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The three weeks of data collection were done using the physical and electronic means of data collection. The researcher sent printed questionnaires to local experts, whereas the version based on the Google Forms methodology was sent through e-mail to other respondents in the faraway area. The respondents were told about confidentiality and anonymity and participation was voluntary. One reminder was also sent out after a week to determine the increase in the response rates. The mixed-mode administration plan followed the recommendations by Robson (2020) to cover a predominant amount of data and enhance the quality of data. The appropriate institutional review board provided ethical approval of the study, and additionally, the consent was included in the questionnaire introduction (Morse et al., 2022). Further, the coding and analysis of the responses were done using Statistical Package of Social Sciences (SPSS) version 27. The reason behind the selection of SPSS is its powerful statistical operations and user-friendly nature, which makes it optimal when conducting the analysis of survey data in the social study (Saunders et al., 2019). The software has enabled descriptive (means, frequencies, percentages) and inferential statistics, and independent-sample t -tests used to test the study hypotheses. T -tests were used to determine whether there were any significant differences in the opinion of respondents depending on the background (demographic or organisational background). This analytical option worked well since the Lickert-scale items were of the interval type, and the means of two groups were to be compared (Frankfort -Nachmias et al., 2021). As expected with the positivist paradigm (Easterby-Smith et al., 2018), SPSS allowed the researcher to remain objective, improve the accuracy of the data, and use the rigour of to statistics. Tables and charts were used to present the results in a way that allows their interpretation. The descriptive and inferential analyses were a combination that brought to the fore the entire picture of the ethics of automation.

Table 1: Demographic Distribution of Respondents.

Variable	Category	Frequency (f)	Percentage (%)
Sex	Male	178	53.5%
	Female	155	46.5%
Age Range	18 – 25 years	72	21.6%
	26 – 35 years	115	34.5%
	36 – 45 years	86	25.8%
	46 – 55 years	39	11.7%
	Above 55 years	21	6.3%
Highest Educational Qualification	SSCE/WAEC	42	12.6%
	OND/NCE	66	19.8%
	HND/Bachelor's Degree	138	41.4%
	Master's Degree	64	19.2%
	PhD and above	23	6.9%
Occupation	Student	80	24.0%
	Civil Servant	97	29.1%
	Private Sector Employee	65	19.5%
	Entrepreneur	41	12.3%
	Unemployed	30	9.0%
	Other	20	6.0%
Familiarity with Automation/AI	Very Familiar	89	26.7%
	Somewhat Familiar	131	39.3%
	Not Very Familiar	74	22.2%
	Not at All Familiar	39	11.7%

Table 1 offers the demographic information of the 333 participants, who participated in exploring ethical concerns in relation to advanced automation. In regard to gender, there was a slight majority, played by a marginal group of 53.5 percent male respondents as opposed to 46.5 percent females, implying a fairly balanced gender distribution. Regarding age, the bracket 2635 years of age had the highest number (34.5 percent) then 3645 years (25.8percent) then the 46-65 years bracket had the very lowest percentage of 1.3 percent. The age groups of 1825 years (21.6) and the age groups of 4655 years and above 55 years (11.7 and 6.3) made up the proportion of the participants, respectively.

Regarding the level of education, 41.4%- had an HND or a Bachelor degrees, 19.8%- had an OND/NCE, and 19.2%- had a Master degree. Those who had secondary qualifications (SSCE/WAEC) formed 12.6% but the least percentage included a PhD or higher (6.9%). In such a way, most of the respondents had tertiary education, which allowed them to understand the ethical aspects of automation. In occupational terms, civil servants were the highest (29.1) then

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students (24.0), and the employees in the private sector (19.5). They involved 12.3 and 9.0 percent of entrepreneurs and the unemployed respectively and 6.0 percent of other unspecified occupations. These statistics demonstrate a dispersion of median workforce which is relevant to the aims of the study. Lastly, assessing the level of familiarity with automation or AI systems, 39.3 said that they are slightly familiar, and 26.7 most of them said that they are deeply familiar. This was in contrast to 22.2% that said that they are only slightly familiar, and 11.7% that said that they were not familiar at all. In turn, most people are poorly informed about AI and automation, which is why a significant minority does not have sufficient access to this knowledge, which can potentially influence their ethical considerations.

Data Analysis and Answers to Research Questions

Table 2: Primary Ethical Concerns Associated with Advanced Automation.

Statement	Response Category	Frequency (f)	Percentage (%)
Advanced automation raises significant concerns about job loss and economic inequality.	Strongly Agree	146	43.8%
	Agree	121	36.3%
	Uncertain	29	8.7%
	Disagree	22	6.6%
	Strongly Disagree	15	4.5%
Privacy violations are one of the major ethical risks in automated systems.	Strongly Agree	138	41.4%
	Agree	127	38.1%
	Uncertain	31	9.3%
	Disagree	25	7.5%
	Strongly Disagree	12	3.6%
AI-based automation can result in decisions that lack human empathy and accountability.	Strongly Agree	129	38.7%
	Agree	135	40.5%
	Uncertain	28	8.4%
	Disagree	24	7.2%
	Strongly Disagree	17	5.1%
Algorithmic bias is a serious ethical issue in many automated decision-making systems.	Strongly Agree	142	42.6%
	Agree	126	37.8%
	Uncertain	30	9.0%
	Disagree	21	6.3%
	Strongly Disagree	14	4.2%
The rapid implementation of automation often overlooks its long-term ethical consequences.	Strongly Agree	134	40.2%
	Agree	129	38.7%
	Uncertain	36	10.8%
	Disagree	20	6.0%
	Strongly Disagree	14	4.2%

The answers of 333 people are presented in Table 2 with regard to the major ethical issues relating to advanced automation. The results indicate wide agreement regarding paramount matters. On job loss and economic inequality, 80.1 percent of the respondents supported this as a significant ethical issue with forty three point eight percent of the respondents strongly agreeing with this and thirty six point three percent of respondents agreeing with this. Only one

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out of 11.1 indicated a disagreement or strong disagreement whereas 8.7 indicated that they were not sure. Violation of privacy was understood similarly as a significant threat as 41.4% strongly agreed, and 38.1% agreed which makes a total of 79.5%. Only a minority (11.1) (disagreed or was not sure). The results highlight a heightened sensitivity of individual data and security to the possibility of invasion by the automation systems. The claim that AI systems lack human empathy and responsibility were supported by the greatest percentage of respondents, 79.2 (38.7 strongly agree and 40.5 agree), and this number was only 12.3 (12.3 disagree, 12.3 unsure). Here we can see a strong fear of the surrender of some of the most sensitive decisions to the un-human agents. There was also an occurrence of algorithmic bias, as 80.4% of them confirm the seriousness of this problem (42.6% strongly agree, 37.8% agree). The constant high rate of concurrence shows that the participants can be aware of the possible discriminating results that could be caused by disparaged data or flawed AI design. Lastly, the majority of respondents (78.9% strongly agreeing, 38.7 agreeing) believed that the rapid implementation of automation does not usually consider the ethical implications of the same practice in the long term. It was only 10.2 per cent on the disagreement and strong disagree comparison, with 10.8 per cent being uncertain.

Table 3: How Current Ethical Frameworks Address the Challenges of Automation

Statement	Response Category	Frequency (f)	Percentage (%)
Existing ethical frameworks are not adequate for addressing the risks posed by automation.	Strongly Agree	139	41.7%
	Agree	132	39.6%
	Uncertain	33	9.9%
	Disagree	18	5.4%
	Strongly Disagree	11	3.3%
Most automation policies lack clear accountability structures for AI-driven decisions.	Strongly Agree	128	38.4%
	Agree	137	41.1%
	Uncertain	34	10.2%
	Disagree	20	6.0%
	Strongly Disagree	14	4.2%
Ethical guidelines are often ignored during the development and deployment of AI systems.	Strongly Agree	133	39.9%
	Agree	129	38.7%
	Uncertain	37	11.1%
	Disagree	21	6.3%
	Strongly Disagree	13	3.9%
Regulatory frameworks need to be updated to better govern automation technologies.	Strongly Agree	147	44.1%
	Agree	122	36.6%
	Uncertain	30	9.0%
	Disagree	20	6.0%
	Strongly Disagree	14	4.2%
Developers and corporations should be held ethically accountable for the use of automation.	Strongly Agree	153	45.9%
	Agree	118	35.4%
	Uncertain	31	9.3%
	Disagree	19	5.7%
	Strongly Disagree	12	3.6%

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Table 3 outlines the responses of the respondents on issues related to the effectiveness of current ethical theories used in addressing the issues linked to advanced automation. These findings unveil a solid objection that the current structures cannot adequately serve in good governance. Precisely, 81.3% of interviewees (41.7% strongly agreeing and 39.6% agreeing) argued that the existing ethical guidelines have failed to put mitigation measures on automation risks. The rate of disagreement only amounted to 8.7% but the uncertainty rate was 9.9%. Similarly 79.5 per cent also agreed with the idea that most policies on automation do not define clear constructed accountability to AI-driven decisions with 38.4 strongly agreeing and 41.1 agreeing. This highlights a deep policy gap in the implementation of policies in which accountable processes are either non-existent or vague. When it comes to observing ethical standards during the development of the AI system, 78.6 percent supported the issue, 39.9 percent said that he/she agrees strongly and 38.7 percent agreed. This signs with an underlying view that there has been a lack of uniformity in the implementation of ethical codes in the life cycle of automation technologies. Asked whether or not regulatory schemes should be rewritten, 80.7 per cent. said yes and 44.1 per cent. said strongly yes. Only 10.2% said that they were against or strongly against it, which is indicative of an absolute need to reform legal and institutional realities. The strongest agreement was concerned with the view of holding developers and corporations held ethically to account: 81.3 percent strongly agreed (45.9) or agreed (35.4) with the position. This means that the respondents hold the designers and implementers of automated systems ethically responsible and not the governmental and regulatory bodies only. Overall, the results are an indication that modern ethical and regulatory frameworks are perceived to be inadequate in regulating the rapid growth and sophistication of automation. The participants demand better accountability, more rigorous adherence to the ethical regulations, as well as faster adjustment of the legal framework that would enable responsible and fair application of automation.

Table 4: Strategies to Mitigate Ethical Risks in Automation

Statement	Response Category	Frequency (f)	Percentage (%)
Increasing transparency in AI systems can help reduce ethical concerns.	Strongly Agree	144	43.2%
	Agree	130	39.0%
	Uncertain	29	8.7%
	Disagree	18	5.4%
	Strongly Disagree	12	3.6%
Regular ethical audits should be conducted for organisations using advanced automation.	Strongly Agree	139	41.7%
	Agree	132	39.6%
	Uncertain	33	9.9%
	Disagree	17	5.1%
	Strongly Disagree	12	3.6%
Public involvement in AI policy-making can improve ethical accountability.	Strongly Agree	127	38.1%
	Agree	136	40.8%
	Uncertain	40	12.0%
	Disagree	19	5.7%
	Strongly Disagree	11	3.3%
Training developers in ethical principles is essential to responsible automation.	Strongly Agree	143	42.9%
	Agree	128	38.4%
	Uncertain	30	9.0%
	Disagree	20	6.0%
	Strongly Disagree	12	3.6%

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Establishing enforceable laws can help minimise ethical violations in automation.	Strongly Agree	150	45.0%
	Agree	124	37.2%
	Uncertain	29	8.7%
	Disagree	18	5.4%
	Strongly Disagree	12	3.6%

Table 4 provides a summary of the views of the respondents concerning the strategies that they consider efficient to ensure that ethical risks observed in automation are reduced. There was overwhelming agreement of the suggestion that improved transparency in AI systems can ameliorate ethical issues, as 82.2% of the participants said that they agree with the statement (43.2% strongly agree; 39.0% agree); only 9% disagreed or strongly disagreed. Another similar pattern was witnessed regarding the need to conduct frequent ethical audit of organisations using advanced automation; 81.3 quality of 81.3 showed a strong agreement and 80.3 indicated that strong agreement was expected to continue with high need of the ongoing oversight and regular ethical analysis in AI practices. On the importance of including people in the policymaking process of the respondents (38.1 strongly agree; 40.8 agree) argued that public inclusion may enhance ethical responsibility. Although 12.0% of participants said that they were unsure, which is slightly greater than that of other statements, there was generally strong agreement. The support with regard to development of developers and training on ethical principles was high with 81.3 per cent of the respondents confirming that it is essential when implementing AI in a responsible way. Still, a small group (9.6 percent) disagreed or was ambivalent, thus demonstrating that the importance of informed developers is widely accepted in the ethical application. Last, the suggestion to have enforceable law to regulate AI and automation reached its peak point of strong agreement (45.0), and 37.2 per cent of habitual agreement (82.2 per cent). This indicates some serious need of legal regulations that are beyond voluntary compliance and require mandatory regulatory provisions.

Table 5: One-Sample t-test Results

Hypothesis	Test Value	Mean	Std. Dev.	t	df	Sig. (2-tailed)
Advanced automation does not significantly impact employment, leading to job displacement and economic inequality.	3.00	4.13	0.91	21.25	332	0.000
AI-driven decision-making systems do not exhibit biases that disproportionately affect marginalised groups.	3.00	4.06	0.95	18.87	332	0.000
Transparent and accountable AI frameworks do not reduce ethical risks in automation.	3.00	4.01	0.88	17.95	332	0.000

The results of a one-sample t-test that was aimed to assess three null hypotheses in relation to the ethical implications of advanced automation are indicated in Table 4.5. The selected test value of 3.00 represents the middle ground concerning a 5-point Likert scale, thus, it was used as the reference point in which the degree of agreement of the respondents was statistically measured. The initial hypothesis was that advanced automation does not have any impact of significance in terms of employment and does not lead to economic inequality. With the empirical findings indicate a mean value of 4.13 (SD= 0.91), a t-statistic of 21.25 and a p-value of 0.000 and indicates that it reflect statistically significant deviation of the neutral benchmark, and was able to reject the null hypothesis. The numbers explain why respondents strongly believe that automation has an impact on the employment sphere as well as the level of economic disparity. The latter hypothesis tested the possibility of a bias inherent in the application of AI to make decisions against marginalised groups. The analysis gave the mean 4.06, t statistic 18.87 and p-value, which is once again, significant at 0.05 level hence null hypothesis should be rejected. These findings incriminate the fact that respondents address the existence of the algorithmic bias in the systems of AI. The third hypothesis stated that explicit and responsible AI structures have no power to reduce the risk of ethics. The resulting mean (4.01), t-statistic (17.95), and p-value (0.000) all cause rejection of the null hypothesis to be high enough as it proves that respondents argue that the introduction of the systemof transparency and accountability into AI can actually ease ethical issues. To conclude, all

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three negative responses to the null hypotheses highlights the fact that the respondents were highly sensitive to the ethical and social issues that are spawned by automation. Such findings therefore support the need to have proactive measures that include; fairness audits, transparency measures, and equitable policy modifications that helps to reduce the harm and ensure equitable and ethically responsible use of automation.

Discussion

The results of this paper provide important information on the ethical issues and regulation loopholes that can be related to advanced automation and artificial intelligence (AI). One significant percentage of the respondents also opined that automation poses urgent questions of job loss, breaches of privacy, bias in the algorithm, and unreliability. These results can be related to the conclusions by Al-kfairy et al. (2024), who accentuated the fact that the generative AI technologies bring in new ethical concerns that the current frameworks are not well equipped to handle. They had an interdisciplinary view because they saw the lack of dynamism of existing ethical frameworks in the face of fast-changing AI systems, which is also reflected in the current study study because the majority of respondents believed that the existing ethical frameworks were inadequate. The results of the one-sample t -test confirm the urgency of the need to seal these gaps, in the spheres of employment effects and systemic bias. In line with the morality of robots expressed by DeGrazia (2022), this paper showed that there was an overarching fear that the use of AI in decision-making does not have the required human empathy to deliver just results. DeGrazia cautioned that machines are frequently given the ethical agency and this leads to making a decision that lacks a finer sort of moral reasoning, a worry that resonates well with the respondents who attest that automation brings fraudulent risks without proper checks and balances.

In answering the question on the contribution of regulatory and technical strategies, participants supported the intention of transparency, developer ethical training, participation by the people and stricter laws by a large majority. According to those results, the suggested arguments by Bokhari and Myeong (2022) based on the proposal of a participatory form of governance in smart cities can offer an opportunity to implement AI in a way that is inclusive and socially responsible. Likewise, Memarian and Doleck (2023) have highlighted the relevance of the FATE principles, i.e., Fairness, Accountability, Transparency and Ethics, in the field of AI governance, which is also present in this research, with the involvement of the participants having the principles in mind to prevent the emergence of ethical risks. The necessity of frequent ethical audits was also supported by respondents, which, as Stahl (2021) claims, anticipates the incorporation of ethics into the stage of designing and assessing the creation of the technology. The aspect of ethical deliberation must be incorporated in innovation processes to prevent ethical lag, which was mentioned by Stahl to be directly proportional to the results of the research that indicated that contemporary policies are primarily lacked of accountability structure. Kalenzi (2022) also admits this delay and has written about the governance challenges with new technologies such as blockchain and AI, especially in the LMICs (Low- and Middle-Income Countries) with less regulatory capacity. Through a healthcare prism, Choudhury et al. (2022) emphasized the necessity of data-driven technologies to have privacy-protecting mechanisms. The respondents in the present study were also worried about the privacy of their data, which is a significant field of ethical conflict in AI usage. Sebastian (2023) also supports this claim by explaining how AI chatbots like ChatGPT are vulnerable to sensitive information when it comes to processing sensitive information. All these findings combined indicate that privacy can still be considered as one of the pillars of ethics that needs strong regulatory action. In addition, Durante (2023) noted that the moral pluralism and ethical need to be inclusive also, and that dialogue is recommended between differing moral communities. The high belief in the citizens engaging in the policy-making of AI in this study justifies the necessity to join hands in norm-building, particularly those of pluralistic society, in which automation disproportionately affects varied groups of people.

Recommendations

With the results of this study, five recommendations aimed at enhancing the ethical practice and governance of advanced automation systems are listed below:

i. Introduce and enforce Ethical Rules: Governments and regulators must introduce enforceable laws that will cover the ethical threats of automation. These rules must include the aspects of data privacy, responsibility of algorithms, labor laws, and non-discrimination, and through the rules, it should also provide strict ethical standards that all interested parties must follow during the design and implementation of AI systems.
ii. Incorporate Ethics in Training of Developers: Technologists, engineers and system designers need to be trained properly on the topic of ethics as part of the developmental training program. This education must be

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centered around the social, legal, and ethical effects of automation to co-exist towards responsible decision-making, throughout the entire duration of technology lifecycle.

iii. Implement Routine Ethical Audits of AI Systems Organizations using AI and automation must establish regular ethical audits to determine adherence to their policies, possible harms, and systems to make them more transparent, fair, and accountable as they operate to allow compliance in the long-run. These audits are to be conducted by the independent specialists and inclusive of open public reporting.

iv. Enact Public Consultation and Participation in AI Policy-Making: Policymakers should establish forums where everyone can be consulted and participate in formulating the AI governance policy to ensure that the views of all people, especially the vulnerable and the disparate, are considered during the process.

v. Make Automated Systems Transparent and Explainable: The developers should create AI systems having those mechanisms, to ensure that they are simple to understand how the decisions are made. Explainable systems that are not concealed can create trust, minimize misinformation and enable users to discover and question inappropriate or biased results.

Conclusion

The results of hypothesis testing prove that advanced automation has a profound impact in the key areas of ethical prospect, in particular, employment, prejudice, and responsibility. The disapproval of the initial hypothesis supports the high level of concurrence of respondents in relation to the automation leading to job loss and compounding the levels of economic inequality, thus shedding light on the socio-economic consequences of adopting AI systems without elaborate labour transition policies. The second hypothesis also proved to be false; empirical research testifies that the AI-based system of decision-making may be biased, affected disproportionately by the marginalized population. This highlights the importance of justice, equality, and the reduction of bias in the creation and application of systems of artificial intelligence. Additionally, the disproving factor of the third hypothesis suggests that transparent and responsible AI models are viewed as critical in the process of reducing ethical hazards. All these results show that the ethical issues of automation are not merely a theoretical subject matter but instead, they are concrete and common to an average person. The findings, therefore, demand prompt regulatory, technical, and institutional remedies so that automation would be done in a responsible manner. Etihad should incorporate ethical standards into the developmental process, which should be supported by strong enforceable policies and involvement of the people. Finally, the paper confirms the importance of considering the ethical aspects in the process of automation in an effort to have the socially just, transparent and accountable technological development.

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