



INTEGRATING PSYCHOLOGICAL WOMEN EMPOWERMENT INTO AI-DRIVEN ETHICAL FRAMEWORKS: A FACTORIAL ANALYSIS APPROACH

Nurwahida Fuad^{1*}, Abdul Manaf Bohari², Ima Ilyani Ibrahim³, Shafiq Shahrudin⁴

¹ Faculty of Business and Managements, Universiti Teknologi MARA, Perlis Branch, Arau Campus, 02600 Arau, Perlis, Malaysia

Email: wahida.fuad@uitm.edu.my

² Department of Business Management, College of Business, Universiti Utara Malaysia, 06010 Sintok, Kedah Malaysia

Email: manafdr@uum.edu.my

³ Faculty of Business and Managements, Universiti Teknologi MARA, Perlis Branch, Arau Campus, 02600 Arau, Perlis, Malaysia

Email: ilyani686@uitm.edu.my

⁴ Faculty of Business and Managements, Universiti Teknologi MARA, Perlis Branch, Arau Campus, 02600 Arau, Perlis, Malaysia

Email: shafiqshahrudin@uitm.edu.my

* Corresponding Author

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Abstract:

The rapid advancement of Artificial Intelligence (AI) has transformed various sectors, yet its ethical implications, particularly concerning marginalized groups such as women, remain inadequately addressed. This study explores the dimensions of Psychological Women Empowerment (PWE) and investigates how these dimensions can be integrated into a global ethical framework shaped by AI. Using factorial analysis, the research identifies three key factors of psychological empowerment: Leadership, Improve Welfare, and Community Organizing (Factor 1), Self-Identity and Responsibility (Factor 2), and Increase Awareness (Factor 3). The study, which involved 500 respondents, further examines how AI can be leveraged to enhance women's empowerment while adhering to ethical principles such as fairness, transparency, and accountability. The findings indicate that AI-driven solutions can significantly contribute to women's empowerment, provided they are designed with ethical considerations in mind. This research offers valuable insights for policymakers, AI developers, and researchers working towards a more equitable and ethical global society.



Introduction

The integration of artificial intelligence (AI) into various sectors has ushered in unprecedented opportunities for innovation and efficiency. However, this technological advancement also raises significant ethical concerns, particularly regarding its impact on marginalized groups, including women. The intersection of AI and gender equity presents a critical area of research, as the deployment of AI systems can either reinforce existing inequalities or serve as a powerful tool for empowerment. This study aims to explore the integration of psychological women empowerment into AI-driven ethical frameworks through a factorial analysis approach, addressing the pressing need for inclusive and equitable AI systems.

The problem of gender inequality in technology is multifaceted and deeply rooted in socio-economic structures. Access to technology has been shown to enhance women's socio-economic status, particularly in developing regions. For instance, Nabizada et al. (2024) highlighted that increased access to digital tools significantly improves women's social and economic conditions in Afghanistan, underscoring the potential of technology to empower women. However, despite these advancements, women continue to face systemic barriers that limit their access to and participation in technology-driven environments. This disparity is exacerbated by the lack of ethical considerations in AI development that specifically address the unique challenges faced by women, such as bias, discrimination, and lack of representation (Ayinla et al., 2024). While AI holds substantial potential for advancing women's empowerment, the technology must be carefully designed to avoid perpetuating existing biases. With ethical use, inclusive data practices, and active engagement from women in AI development, AI can serve as a critical tool for closing gender gaps and promoting women's empowerment (Abida, 2025).

Current ethical AI frameworks often prioritize broad principles such as transparency, accountability, and fairness without adequately considering the psychological dimensions of empowerment for women. Morley et al. (2019) discuss how ethical principles should be integrated into the stages of algorithmic development, yet often these frameworks overlook how algorithms can perpetuate gender biases if not designed with an understanding of women's experiences and needs. This oversight can lead to AI systems that not only fail to empower women but may also reinforce existing inequalities, thereby hindering the potential of AI to serve as a transformative force for gender equity.

Moreover, the lack of empirical research exploring the relationship between psychological empowerment and ethical AI frameworks presents a critical challenge. The factorial analysis approach offers a methodological avenue to investigate these relationships, allowing for the identification of key factors that influence women's empowerment in AI environments. By examining how psychological empowerment can be effectively integrated into AI-driven ethical frameworks, this study seeks to address the pressing need for inclusive and equitable AI systems that prioritize the unique challenges faced by women.

The integration of psychological women empowerment into AI ethics is not merely an academic exercise; it is a moral imperative. As AI technologies continue to permeate various aspects of society, the ethical implications of their deployment must be scrutinized through the lens of gender equity. Ethical AI frameworks must evolve to incorporate diverse perspectives and experiences, particularly those of women, to ensure that AI systems contribute to social good rather than exacerbate existing disparities. Agarwal et al. (2024) emphasize the importance of identifying ethical values and norms in AI to promote responsible practices. This study aims to contribute to this discourse by proposing a factorial analysis approach that integrates psychological empowerment into AI-driven ethical frameworks, ultimately fostering a more equitable technological landscape.

In conclusion, the integration of psychological women empowerment into AI-driven ethical frameworks is essential for addressing the unique challenges faced by women in technology-driven environments. By employing a factorial analysis approach, this study seeks to illuminate the complex interplay between psychological empowerment and ethical AI practices, providing insights that can inform the development of inclusive and equitable AI systems. As we navigate the ethical complexities of AI, prioritizing women's empowerment is not only a matter of fairness but also a crucial step toward realizing the full potential of technology as a catalyst for social change. The remainder of this paper is organized as follows. First, the brief review of the psychological women empowerment and AI and ethical framework. Second, the role of psychological empowerment that represent as a crucial driver in the intersection of AI. Next, we present the methodology employed such as the instrument used and respondents involved. Finally, based on the result generated, we make a conclusion on how the study conducted may assist the future studies in AI ethical framework for women development.

Literature Review

Psychological Women Empowerment

Psychological empowerment is a multifaceted construct that plays a significant role in enhancing women's agency, self-efficacy, and overall well-being. This empowerment process enables women to gain control over their lives and make informed choices that align with their aspirations. Recent studies emphasize various dimensions of psychological empowerment such as self-awareness, economic independence, and community involvement, which are pivotal for fostering autonomy in women, particularly in settings marked by systemic discrimination and societal barriers (Mahmud et al., 2012).

Self-awareness is a fundamental aspect of empowerment, allowing women to understand their strengths, weaknesses, and needs. This awareness is essential for reframing their identities and asserting their rights in both personal and public spheres (Mahmud et al., 2012). Economic independence empowers women by providing them with the financial resources necessary to make autonomous decisions. It facilitates participation in decision-making processes at both family and community levels, thereby enhancing their social status and encouraging a shift towards gender equality (Sarkar & Singh, 2011).

Community involvement further enriches the psychological empowerment of women by fostering a sense of belonging, support, and mutual aid. Engaging in community activities not only promotes social capital but also serves as a platform for collective action against gender-

based injustices (Rodrigues et al., 2017). Research highlights that the intersection of self-awareness, economic independence, and community involvement is critical for women's resilience and empowerment, enabling them to navigate and challenge the root causes of discrimination.

AI and Ethical Frameworks

The rapid integration of artificial intelligence (AI) technologies into various sectors introduces significant ethical considerations, particularly regarding fairness, transparency, and accountability. While AI has the potential to alleviate existing inequalities, it may also reinforce systemic biases if not carefully designed and implemented (Kan, 2024). Ethical frameworks are essential to guide the development of AI systems, ensuring they prioritize the rights and well-being of marginalized groups, including women (Ashraf, 2020). Current research underscores the necessity of incorporating psychological dimensions into existing ethical frameworks to comprehensively address women's empowerment in the age of AI. Frameworks that neglect psychological dimensions may fail to capture essential factors like self-efficacy and social identity, which are crucial for fostering true empowerment. Ethical AI must also account for the socio-political context in which technology is deployed, as the lack of attention to women's perspectives may perpetuate existing inequalities (Kan, 2024). Moreover, the development of ethical AI should involve a collaborative approach that includes diverse voices, particularly those of women and underrepresented groups, to ensure that AI technologies align with their needs and promote their empowerment (Shapira, Lishchinsky & Tsemach, 2014). This participatory approach is vital for creating a transparent AI ecosystem that serves as a tool for social equity rather than a reinforcement of dominant power structures (Ashraf, 2020).

The Intersection of AI and Women's Empowerment

The intersection of AI and women's empowerment presents a unique opportunity to leverage technology for the advancement of gender equality, provided it is grounded in a robust ethical framework. AI-driven educational platforms can enhance access to tailored learning resources, thereby promoting women's skills development and self-efficacy (Meharunisa et al., 2024; Ashraf, 2020). Additionally, AI-powered healthcare systems can improve access to essential reproductive health services, addressing critical gaps in women's health care (Meharunisa et al., 2024).

Despite the potential benefits, it is imperative that these technologies are developed with ethical considerations in mind to avoid exacerbating existing inequalities. For instance, without inclusive design processes, AI systems may inadvertently reinforce biases, limiting their effectiveness and perpetuating discrimination against women (Ashraf, 2020; Darus et al., 2016). Therefore, it is crucial to implement monitoring and accountability measures that ensure AI technologies respect and promote women's rights (Ashraf, 2020; Darus et al., 2016).

The integration of AI into processes that potentially enhance women's empowerment must proceed with caution and care. Ethical AI frameworks should actively involve women in the design and implementation phases, addressing psychological barriers that may hinder their empowerment. By prioritizing ethical considerations and the psychological aspects of empowerment, AI can become a transformative force that not only advances gender equality but also upholds the dignity and rights of women in society (Kan, 2024; Ashraf, 2020).

Additionally, socio-economic factors limit the benefits women can derive from AI technologies. For instance, lower levels of digital literacy among women restrict their ability to effectively utilize AI tools, which can hinder their participation in the digital economy and their overall empowerment (Amlan, 2024). Another critical issue is resource accessibility; many women, especially in rural areas, have limited ownership of smartphones and inadequate internet connectivity. This lack of access to essential technologies severely impacts their ability to engage with AI resources, thereby reinforcing existing gender disparities in socio-economic opportunities (Jessy, Kibukamusoke & Drake, 2024).

Table 1 presents a summary of the key findings from the literature review, highlighting the main dimensions of psychological empowerment and the ethical considerations necessary for AI development targeting women's empowerment.

Table 1: Summary of Psychological Women Empowerment and AI Ethical Considerations

Theme	Key Points	References
Psychological Women Empowerment	Psychological empowerment enhances women's agency, self-efficacy, and well-being by enabling informed choices and control over life decisions.	Mahmud et al., 2012
Self-Awareness	Recognizing personal strengths, weaknesses, and needs is fundamental for reframing identity and asserting rights.	Mahmud et al., 2012
Economic Independence	Financial autonomy boosts decision-making power in families and communities and advances social status.	Sarkar & Singh, 2011
Community Involvement	Participation in community activities fosters social support, collective action, and resilience against discrimination.	Rodrigues et al., 2017
AI and Ethical Frameworks	Ethical AI must prioritize fairness, transparency, and accountability to avoid reinforcing systemic biases and promote empowerment.	Kan, 2024; Ashraf, 2020
Incorporating Psychological Dimensions	Including psychological factors like self-efficacy and identity in AI ethics frameworks is crucial for genuine empowerment.	Kan, 2024; Ashraf, 2020
Participatory Approach	Development of AI must involve women and marginalized groups to ensure inclusivity and relevance.	Shapira, Lishchinsky & Tsemach, 2014
AI Applications for Women's Empowerment	AI-driven education and healthcare platforms can promote skills development and address gaps in women's health services.	Meharunisa et al., 2024; Ashraf, 2020
Risks of AI	Without inclusive designs, AI systems risk reinforcing biases and exacerbating	Ashraf, 2020; Darus et al., 2016

Theme	Key Points	References
	inequalities. Monitoring and accountability are essential.	
Barriers to AI Access	Limited digital literacy and lack of technology access (smartphones, internet) restrict women's ability to benefit from AI advancements.	Amlan, 2024; Jessy, Kibukamusoke & Drake, 2024

Methodology

This study adopts a quantitative research design to explore the dimensions of Psychological Women Empowerment (PWE) among women entrepreneurs. A structured questionnaire was developed and administered to collect primary data from a representative sample. Factorial analysis was employed as the main statistical technique to identify underlying factors that define psychological empowerment. In addition, ethical considerations, particularly those relevant to AI-driven data analysis, were carefully integrated to ensure fairness, transparency, and accountability throughout the research process. The following sections outline the steps taken for data collection, factorial analysis, and the incorporation of ethical principles

Factorial Analysis

Factorial analysis is a statistical method used to identify and reduce large sets of variables into manageable constructs. In this study, factorial analysis is employed to explore the dimensions of Psychological Women Empowerment (PWE). The analysis involves three main stages: identification of correlations among factors, factor extraction, and factor rotation.

Data Collection

This study employs a structured questionnaire comprising 18 items designed to assess psychological empowerment among women entrepreneurs as indicates in Table 2. The items of questionnaire adapted from Al-Dajani and Marlow, (2013); Stavrositu and Sundar, (2012); Sardenberg, (2008). The questionnaire was self-administered to a sample of 500 respondents, with the sampling frame provided by the Social Welfare Department.

Table 2: Items of Psychological Women Empowerment

PWE1	I believe that I have to do as I think not as what my family says
PWE2	I believe that if I do not help myself, nobody will help me
PWE3*	It is important for me to gain confidence, share experience related to my work and to gain presence in the broader community.
PWE4*	Many people respect me and come for advice.
PWE5*	I am very active in the community and that encourages me to do more.
PWE6	I help many adolescents with their homework
PWE7*	I always wanted to have my own work and I have never looked back.
PWE8	I could bring in more money through my business to support my family.
PWE9	I have to find solution helping those women who are running business at home like me
PWE10	As my business grew beyond my dreams, I employed the other local people to work with me.
PWE11	I am not only responsible for my family, but also for the entire woman I subcontract to and their families.

PWE12	I always think that what would happen to local women if I do not provide job for them.
PWE13	If I do not change things for myself, no one will change them for me.
PWE14	I have to lead the change in my family
PWE15	Without my work, my family could not afford to have a better life.
PWE16*	To stay ahead of my life, I have to be very creative
PWE17	It is not enough to have good quality items, but they have to be unique too.
PWE18	It is my responsibility to have my own identity of product and keep people interested in this.

**Items eliminated after Varimax rotation*

The data is analyzed using the Kaiser-Meyer-Olkin (KMO) test and Bartlett's Test of Sphericity to ensure its suitability for factorial analysis. The results of these tests are presented in Table 3.

Table 3: KMO and Bartlett's Test of Psychological Women Empowerment

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.890
Bartlett's Test of Sphericity	Approx. Chi-Square	3460.30
	df	153
	Sig.	.000

The KMO value of 0.890 indicates that the data is suitable for factorial analysis, with no significant multicollinearity issues. The Bartlett's Test of Sphericity ($p = 0.000$) further confirms that the correlations among the items are sufficient for the analysis.

Factor Extraction and Rotation

The factorial analysis identifies three main factors with eigenvalues greater than 1.00, as shown in Table 4. These factors account for 55.47% of the total variance, with Factor 1 contributing the highest percentage (40.23%).

Table 4: Eigenvalues and Total Variance of Psychological Women Empowerment

Component	Total Variance Explained	% of Variance	Cumulative %
Factor 1	7.242	40.231	40.231
Factor 2	1.593	8.849	49.079
Factor 3	1.151	6.392	55.472

The factors are further refined using **Varimax rotation**, which groups items with high factor loadings under the same factor and five items have been eliminated from the instrument. The items involved were PWE3, PWE4, PWE5, PWE7 and PWE16. The rotated component matrix is presented in Table 5.

Table 5: Rotated Component Matrix of Psychological Women Empowerment

Items	Component 1	Component 2	Component 3
PWE13	.725		
PWE6	.659		
PWE9	.648		
PWE10	.602		
PWE8	.596		
PWE11	.595		
PWE15		.724	
PWE17		.689	
PWE12		.637	
PWE18		.554	
PWE1			.830
PWE2			.824
PWE14			.632

Ethical Considerations in AI Development

The study integrates ethical principles such as **fairness, transparency, and accountability** into the analysis. These principles are crucial for ensuring that AI-driven solutions for women's empowerment are developed in a manner that promotes equity and justice.

Findings

AI and Ethical Frameworks

Based on the result of factorial analysis, the study explores how AI can be integrated into the ethical framework for women's empowerment. For example:

- **Factor 1:** AI can be used to develop platforms that enhance women's leadership skills and improve access to welfare programs.
- **Factor 2:** AI algorithms can promote self-identity and responsibility by providing personalized feedback and recommendations.
- **Factor 3:** AI-powered educational tools can increase awareness about women's rights and ethical considerations in AI development.

Consequently, the study developed the framework by integrating psychological women empowerment into AI-driven ethical as indicates in Figure 1. The framework is built around two core constructs namely psychological women empowerment (PWE) and AI-driven ethical framework. These constructs are interconnected and influence each other, with the goal of promoting gender equity and ethical AI development.

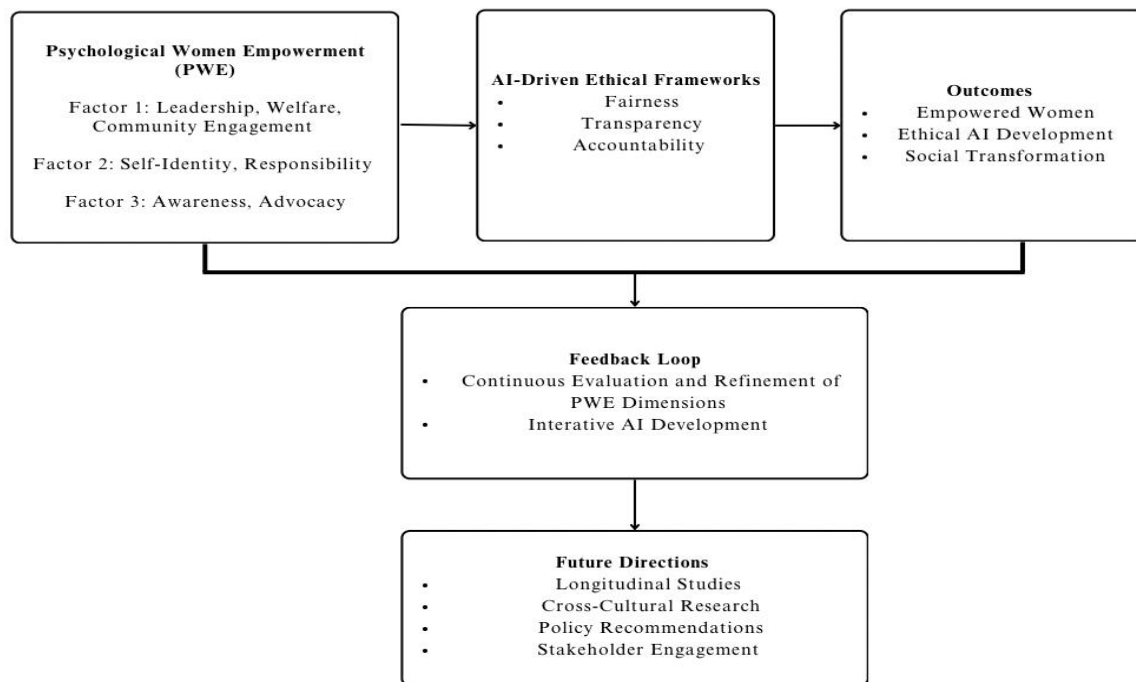


Figure1: Integrating Psychological Women Empowerment into AI-Driven Ethical Framework

The framework highlights five key components: the dimensions of Psychological Women Empowerment (PWE), the AI-driven ethical framework, the integration of PWE into AI ethics, the intended outcomes, and the feedback loop along with associated ethical implications.

Dimension of PWE:

The factorial analysis in the study identified three key dimensions of PWE:

i. Leadership, Improve Welfare, and Community Organizing (Factor 1)

- a) Leadership: Enhancing women's ability to take on leadership roles in various sectors.
- b) Improve Welfare: Access to resources and programs that improve women's socio-economic conditions.
- c) Community Organizing: Encouraging women to participate in community-driven initiatives.

ii. Self-Identity and Responsibility (Factor 2)

- a) Self-Identity: Developing a strong sense of self-awareness and confidence.
- b) Responsibility: Encouraging women to take responsibility for their personal and professional growth.

iii. Increase Awareness (Factor 3)

- a) Awareness of Rights: Educating women about their rights and opportunities.
- b) Awareness of Ethical AI: Increasing understanding of how AI can impact women's lives and how ethical AI can be leveraged for empowerment.

AI-Driven Ethical Frameworks

The ethical framework for AI development is guided by three key principles:

- i. Fairness: Ensuring that AI systems do not perpetuate biases or discrimination against women.
- ii. Transparency: Making AI algorithms and decision-making processes understandable and accessible.
- iii. Accountability: Holding developers and organizations responsible for the ethical implications of AI systems.

Integration of PWE into AI-Driven Ethical Frameworks

The framework proposes that the dimensions of PWE can be integrated into AI-driven ethical frameworks through the following mechanisms:

i) AI for Leadership and Welfare (Factor 1): AI can be used to develop platforms that enhance women's leadership skills and improve access to welfare programs. For example, AI-driven mentorship programs can help women develop leadership qualities, while AI-powered welfare systems can ensure equitable distribution of resources.

ii) AI for Self-Identity and Responsibility (Factor 2): AI algorithms can promote self-identity and responsibility by providing personalized feedback and recommendations. For instance, AI-driven career counselling tools can help women identify their strengths and take responsibility for their career development.

iii) AI for Awareness (Factor 3): AI-powered educational tools can increase awareness about women's rights and ethical considerations in AI development. For example, AI-driven awareness campaigns can educate women about their rights and how to advocate for themselves in technology-driven environments.

Outcomes

The integration of PWE into AI-driven ethical frameworks is expected to lead to the following outcomes: 1) Empowered Women: Women will feel more confident, capable, and in control of their lives, leading to greater participation in technology-driven environments, 2) Ethical AI Development: AI systems will be more transparent, fair, and accountable, ensuring that they do not reinforce existing inequalities, 3) Enhanced Gender Equity: AI systems that are designed with psychological empowerment in mind will contribute to reducing gender disparities in various sectors,

Feedback Loop

The framework includes a feedback loop where the outcomes of AI-driven ethical frameworks are continuously evaluated and used to refine the dimensions of PWE. This ensures that the framework remains dynamic and responsive to the evolving needs of women in technology-driven environments.

Ethical Implications

The study highlights the importance of developing AI systems that are fair, transparent, and accountable. For instance, AI algorithms must be designed to avoid biases that could disproportionately affect women, particularly in areas such as employment and healthcare.

Discussion and Conclusion

The integration of psychological women empowerment into AI-driven ethical frameworks is not only a theoretical endeavor but also a practical necessity that has significant implications for gender equity and social justice. This study highlights the critical role that AI can play in promoting women's empowerment, particularly in addressing systemic barriers and biases that women face in various sectors. By incorporating psychological empowerment into ethical AI frameworks, we can create systems that not only recognize but actively work to dismantle the inequalities that persist in society. The implications of this research are manifold. First, the findings underscore the importance of developing AI systems that are sensitive to the unique challenges faced by women. Ametepey et al., (2024) note that AI's capabilities in data analysis can be harnessed to identify and address areas of discrimination against women, providing a robust tool for promoting gender equality. This proactive approach can lead to timely interventions and preventive measures that empower women and enhance their participation in various domains, including education and employment.

This study builds upon existing literature that emphasizes the intersection of AI, ethics, and women's empowerment. For instance, the work of Aggarwal et al. (2018) highlights the importance of structural empowerment in enhancing women's psychological empowerment and organizational commitment. Similarly, the findings of Mahalakshmi & Jayanthiladevi (2024) demonstrate how AI can promote social change and advocacy for women's rights, reinforcing the notion that technology can serve as a catalyst for positive transformation. Moreover, the research aligns with the perspectives presented by Guevara-Gómez and López (2021), who argue that AI must be approached with a feminist lens to ensure that it does not reinforce existing gender stereotypes. By integrating psychological empowerment into AI ethics, this study contributes to the ongoing discourse on how technology can be leveraged to promote gender equality and empower women, ultimately fostering a more equitable society.

Moreover, the study emphasizes the need for policymakers and practitioners to prioritize psychological empowerment as a key component of AI ethics. By fostering an environment where women feel empowered to engage with technology, we can enhance their ability to leverage AI for personal and professional growth. This aligns with the findings of Mohebbi et al., (2018), who highlight the significance of psychological empowerment in health-related contexts, suggesting that similar frameworks can be applied across various sectors to improve women's outcomes. Future research should explore the specific mechanisms through which psychological empowerment can be effectively integrated into AI-driven ethical frameworks. Longitudinal studies that track the impact of such frameworks on women's empowerment outcomes would provide valuable insights into their effectiveness. Additionally, qualitative research that captures the lived experiences of women interacting with AI systems can inform the development of more inclusive and responsive technologies. Furthermore, comparative studies across different cultural and socio-economic contexts would enhance our understanding of how psychological empowerment manifests in diverse settings. For instance, examining the role of AI in promoting women's empowerment in developing countries, as discussed by Ametepey et al., (2024), could yield important insights into the unique challenges and opportunities that exist in these contexts.

In conclusion, the integration of psychological women empowerment into AI-driven ethical frameworks is essential for addressing the unique challenges faced by women in technology-driven environments. By prioritizing psychological empowerment, we can create AI systems

that not only recognize but actively work to dismantle systemic inequalities, paving the way for a more inclusive and equitable future.

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