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Using Blockchain to Strengthen Women's Rights in Developing Societies: A Case Study of an Online University

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Abstract

The study investigates the potential of blockchain technology in empowering women in developing societies, particularly through enhancing secure digital identities, financial independence, and educational opportunities. In many developing countries, women face significant challenges accessing secure digital services, financial systems, and higher education. Blockchain, known for its transparency, security, and decentralization, presents a promising solution to these challenges. The primary purpose of this research is to evaluate the impact of blockchain technology on improving these areas, with a focus on online education. The research adopts a quantitative approach, utilizing a survey questionnaire to collect data from 120 women aged 20-25 from three faculties: Economics (50), Computer Science (50), and Education (20) in an online university. The data is analyzed using descriptive statistics, including percentages and mean scores, to assess women's perceptions of blockchain technology's benefits in securing digital identities, facilitating financial independence, and enhancing access to education. The results show that blockchain technology has the potential to significantly improve women's access to secure digital identities and financial services, thereby promoting financial independence and reducing gender disparities in education. However, barriers such as high implementation costs remain a significant challenge to widespread adoption. In conclusion, while blockchain technology offers a promising solution for women's empowerment in developing societies, further research and investment are needed to address its implementation challenges and ensure its accessibility for all women.

Keywords: Blockchain technology, women's empowerment, secure digital identities, financial independence, online education

Introduction

The digital revolution has introduced transformative technologies that have the potential to address gender inequality in developing societies. Among these, blockchain technology stands out as a secure, decentralized, and transparent system that can empower women by ensuring financial inclusion, educational access, and legal rights enforcement. With its ability to facilitate trust, eliminate intermediaries, and provide secure record-keeping, blockchain is increasingly being explored as a tool for promoting gender equality and women's rights (Adams et al., 2019). In societies where traditional governance and financial institutions fail to provide equitable opportunities for women, blockchain can play a crucial role in mitigating systemic biases and enhancing access to essential services, such as education, finance, and social protection (Thylin & Duarte, 2019).

Blockchain can be leveraged to give women in developing societies digital identities, allowing them to access financial resources, own property, and secure employment without discrimination (Di Vaio et al., 2023). Digital identity verification through blockchain-based systems helps prevent identity theft, enhances privacy, and enables secure transactions, which is particularly crucial in societies where women lack legal documentation due to patriarchal restrictions (Kamath, 2018). Furthermore, blockchain-powered smart contracts can ensure fair wages, transparent employment agreements, and secure financial transactions for women in the workforce (Henshaw, 2023).

One of the critical areas where blockchain can contribute is in education. Many women in developing countries face barriers to higher education due to socio-economic restrictions, lack of mobility, and institutional biases (Tang, 2022; Isaacs et al., 2022). Online universities, supported by blockchain technology, offer a unique solution by providing secure and verifiable academic credentials, ensuring global recognition of educational qualifications, and protecting students from fraudulent degree certificates (Frizzo-Barker, 2020; Kamath, 2018). A blockchain-based academic credentialing system ensures that women can pursue online education without fearing institutional discrimination or degree invalidation (Thylin & Duarte, 2019).

This study explores how blockchain technology can be implemented within an online university to enhance security, transparency, and accessibility for female students in developing societies. By leveraging blockchain, online universities can provide a tamper-proof, decentralized record of academic achievements, ensuring that students' qualifications are universally recognized and resistant to fraud (Medaglia & Damsgaard, 2020; Mavilia & Pisani, 2020). Additionally, blockchain-based micro-scholarships and financial aid systems can be implemented to ensure fair distribution of educational funds, helping more women access higher education without financial burdens (Thomason et al., 2018).

This study aims to investigate the role of blockchain technology in strengthening women's rights in developing societies, particularly in online education. The objectives include:

1) Evaluating the effectiveness of blockchain in providing secure digital identities for women.

2) Examining the impact of blockchain-based financial services on women's financial independence.
3) Analyzing how blockchain enhances transparency in credential verification to improve women's access to education and employment opportunities.

Literature Review

Blockchain technology has emerged as a transformative tool in various domains, including finance, healthcare, and education. In the context of women's rights, it presents unique opportunities to bridge gender gaps in developing societies by providing secure digital identities, enhancing financial inclusion, and ensuring transparency in education and employment (Adams et al., 2019).

Blockchain and Women's Digital Identity

One of the major challenges women face in developing societies is the lack of secure and verifiable digital identities, which restricts their access to financial services, education, and legal rights (Thylin & Duarte, 2019). Blockchain-based identity management systems offer a decentralized and tamper-proof method to store personal information, enabling women to own and control their identities without intermediaries (Di Vaio et al., 2023). Studies indicate that blockchain-enabled identity solutions can reduce discrimination and give women greater autonomy in accessing public services (Kamath, 2018). Furthermore, these systems enhance security, privacy, and trustworthiness, making them suitable for digital authentication in the education and employment sectors (Henshaw, 2023; Makkar et al., 2024).

Blockchain for Financial Inclusion of Women

Financial exclusion is a significant barrier for women, particularly in developing nations where traditional banking services are inaccessible due to social and economic constraints (Frizzo-Barker, 2020). Blockchain-based financial services, such as decentralized finance (DeFi) and cryptocurrency, have enabled women to participate in the global economy without requiring traditional bank accounts (Thylin & Duarte, 2019). Research suggests that blockchain-backed microfinance platforms can facilitate direct peer-to-peer lending, reducing dependency on male-dominated financial institutions (Kamath, 2018; Thomason et al., 2018). Additionally, smart contracts ensure transparent and fraud-resistant transactions, further securing women's financial independence (Rehman et al., 2021; Isaacs et al., 2022).

Blockchain in Education and Credential Verification

The education sector in developing societies faces challenges related to fraudulent credentials and limited accessibility for women (Aysan et al., 2021). Blockchain-based credential verification ensures authenticity and prevents tampering with academic records, allowing women to prove their qualifications securely (Tang, 2022; Chinaka, 2016). Universities and online learning platforms have begun adopting blockchain to store academic certificates, reducing the reliance on centralized institutions prone to corruption (Medaglia & Damsgaard, 2020; Mavilia & Pisani, 2020). Moreover, this technology fosters trust among

employers, increasing women's employability and access to job opportunities (Mora et al., 2021; De Villiers et al., 2021).

Challenges and Future Considerations

Despite its advantages, blockchain adoption in women's empowerment faces challenges such as technical complexity, regulatory uncertainty, and digital literacy barriers (Rahman et al., 2022). High implementation costs and lack of awareness in developing societies also hinder its widespread use (Isaacs et al., 2022). Future research should focus on creating user-friendly blockchain solutions and formulating policies that promote gender-inclusive blockchain applications (Kamath, 2018).

Research Method

The research method for this study involves a quantitative research design with a survey approach, as it aims to assess the perceptions of women regarding the impact of blockchain technology in various domains, such as digital identity security, financial independence, and education. The study uses a cross-sectional survey method to collect data from diverse participants, ensuring a comprehensive understanding of their views on the subject.

Population and Sampling

The population for this study consists of 120 women enrolled in an online university, representing three different faculties: Economics (50 participants, age 20-25), Computer Science (50 participants, age 20-25), and Education (20 participants, age 20-25). This stratified sample is chosen to capture a range of perspectives from different academic backgrounds, thereby ensuring the study's findings are generalizable to women in developing societies who engage in online education.

A simple random sampling technique is used to select respondents from each faculty to ensure that every individual has an equal chance of being included in the study. The sample is considered representative of the larger population, with a balance of participants from each faculty group to reduce bias.

Data Collection

Data is collected using a structured questionnaire that includes multiple-choice questions with a five-point Likert scale, enabling participants to express their level of agreement or disagreement with statements related to blockchain technology's impact on digital identity security, financial independence, property rights, educational credibility, and bridging the gender gap. The questionnaire is administered online to accommodate the participants' digital engagement in their academic pursuits.

Data Analysis

The collected data is analyzed using descriptive statistics to calculate frequencies, percentages, and mean scores, offering a clear picture of respondents' opinions. Further analysis is conducted through inferential statistics to identify patterns, relationships, and significant

differences among the responses, particularly focusing on demographic factors such as age and faculty. Statistical software such as SPSS or Excel is used to perform these analyses.

Ethical Considerations

Ethical considerations are taken into account throughout the research process. Informed consent is obtained from all participants, ensuring that they are fully aware of the study's purpose and their right to confidentiality. Participants' anonymity is preserved, and their responses are used solely for academic purposes.

This methodology is designed to yield reliable, valid, and ethically sound results that contribute to understanding the role of blockchain in empowering women in developing societies.

Result

The results section presents the findings of the survey conducted to assess the perceptions of women regarding the impact of blockchain technology on securing digital identities, promoting financial independence, and enhancing access to education. The analysis provides insights into blockchain integration's potential benefits and challenges in developing societies.

Table 1. Demographic Characteristics of the Study Population

Category	Faculty	Age Range	Number of Participants	Percentage
Faculty Distribution	Economics	20-25	50	41.67%
	Computer Science	20-25	50	41.67%
	Education	20-25	20	16.67%
Total			120	100%

The demographic data indicate that the study population consists of 120 women from an online university, representing three faculties: Economics (41.67%), Computer Science (41.67%), and Education (16.67%). The majority of participants belong to the Economics and Computer Science faculties, while the Education faculty has fewer representatives. The age distribution is consistent across all faculties, ensuring a homogeneous sample within the 20-25 age range, which is relevant for analyzing blockchain's impact on women's rights in higher education.

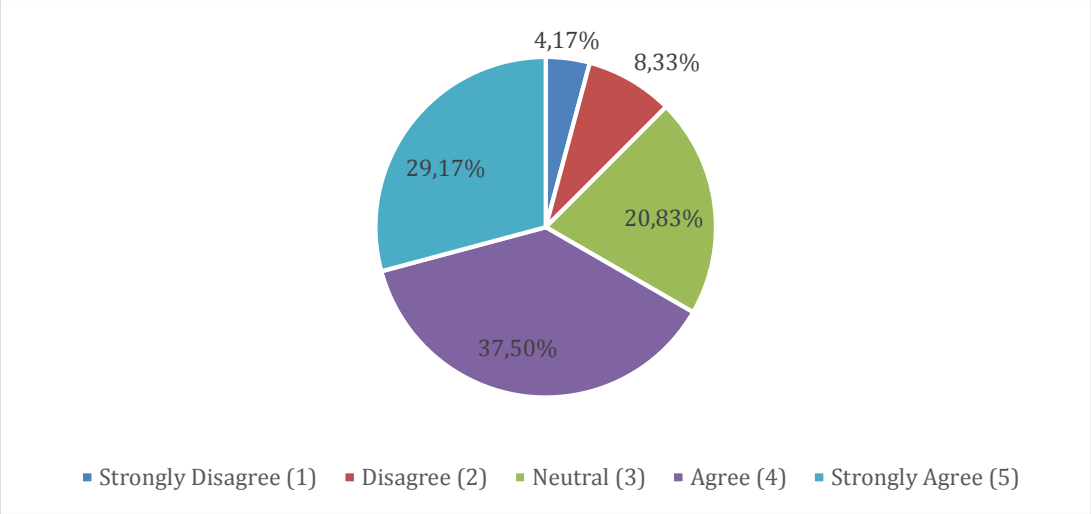

Figure 1. Respondents' Perception of Blockchain Technology in Enhancing Secure Digital Identity for Women

The survey results indicate that most respondents (66.67%) agree or strongly agree that blockchain technology can enhance secure digital identity access for women in developing societies. A neutral stance was observed in 20.83% of the participants, suggesting some level of uncertainty regarding the technology's impact. Only 12.5% (Strongly Disagree & Disagree) of respondents expressed scepticism. These findings highlight a positive perception toward blockchain's potential in addressing digital identity security concerns, suggesting its adoption could play a significant role in women's empowerment in developing regions.

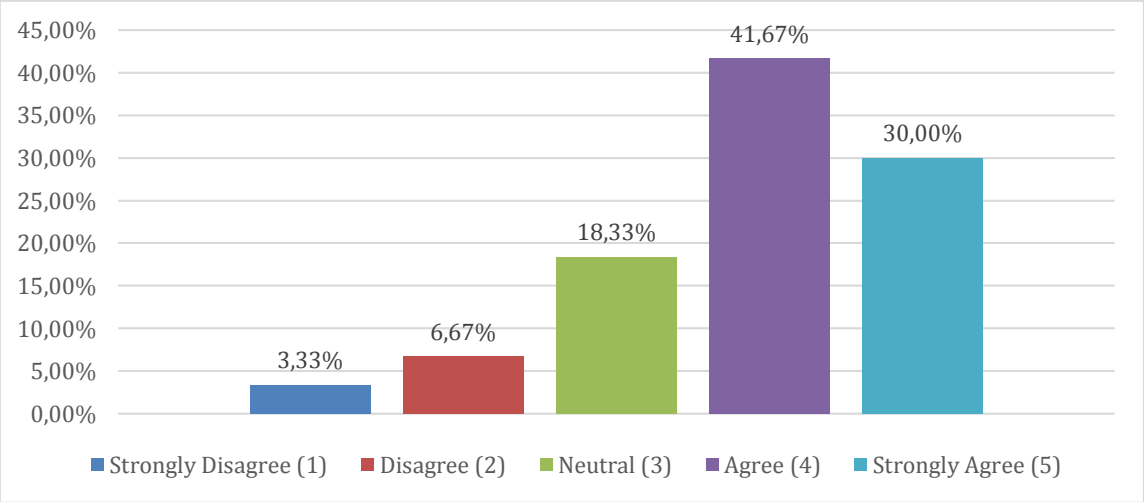

Figure 2. Respondents' Perception of Blockchain-Based Financial Services in Promoting Women's Financial Independence

The results indicate that 71.67% of respondents (Agree & Strongly Agree) believe that blockchain-based financial services can significantly empower women financially in developing societies. 18.33% remained neutral, indicating some level of uncertainty or lack of awareness. A small percentage (10% - Strongly Disagree & Disagree) did not perceive blockchain as a strong financial empowerment tool. The overall trend suggests that blockchain-based financial solutions, such as digital wallets and decentralized finance (DeFi), are widely

viewed as beneficial for increasing financial inclusion and independence among women in developing regions.

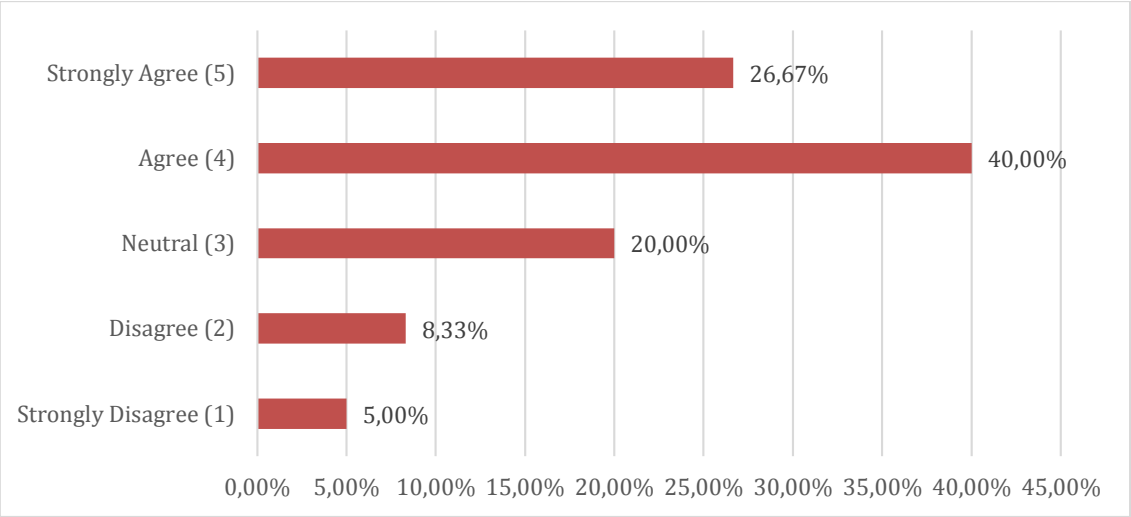

Figure 3. Respondents' Perception of Blockchain Transparency in Reducing Discrimination in Property Ownership and Inheritance Rights

The findings reveal that 66.67% of respondents (Agree & Strongly Agree) believe that blockchain's transparency can help reduce gender-based discrimination in property ownership and inheritance rights. 20% of participants remained neutral, suggesting a need for further awareness or clarification on how blockchain ensures transparency. A minority (13.33% - Strongly Disagree & Disagree) were skeptical about blockchain's role in improving gender equality in property rights. The data suggest a strong perception that blockchain technology can enhance legal protections and equitable access to property for women in developing societies.

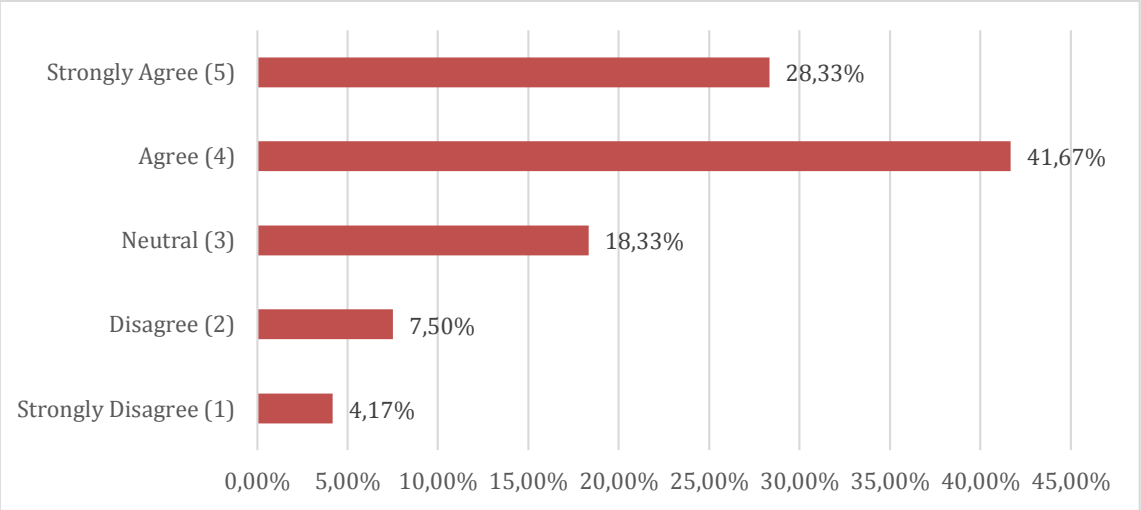

Figure 4. Respondents' Perception of Blockchain-Based Credentialing in Enhancing the Credibility of Online Education for Women

The results indicate that 70% of respondents (Agree & Strongly Agree) perceive blockchain-based credentialing as a tool that enhances trust in online education for women. 18.33% of participants remained neutral, suggesting that some may still be uncertain about the effectiveness of blockchain verification. Only 11.67% (Strongly Disagree & Disagree) expressed scepticism, indicating minimal resistance to blockchain's role in digital credentialing. These findings highlight a strong belief in blockchain's ability to validate online degrees and increase educational credibility for women in developing societies.

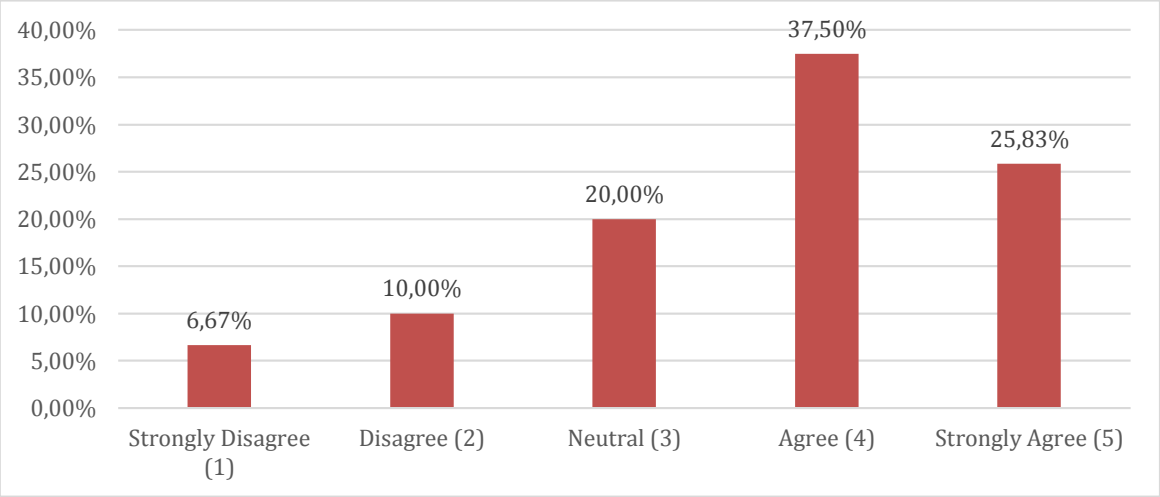

Figure 5. Perception of High Implementation Costs as a Barrier to Blockchain Adoption in Online Education for Women

The findings suggest that 63.33% of respondents (Agree & Strongly Agree) recognize high implementation costs as a significant challenge to integrating blockchain into online education for women. 20% of participants remained neutral, indicating some uncertainty regarding the financial burden. In contrast, 16.67% (Strongly Disagree & Disagree) believe cost is not a major concern. These results highlight financial constraints as a key obstacle, emphasizing the need for cost-effective strategies and policy interventions to facilitate blockchain adoption in the education sector.

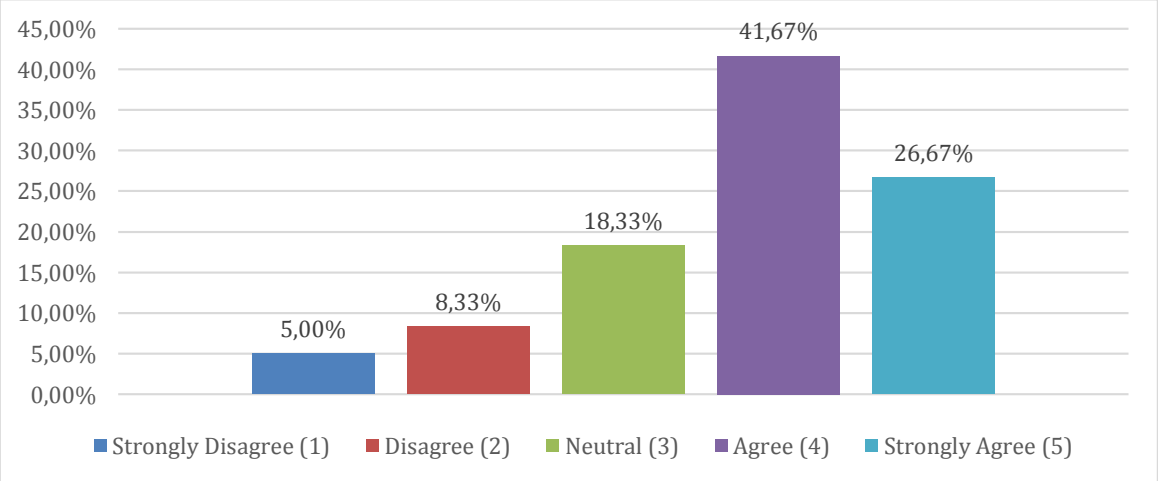

Figure 6. Perception of Blockchain Integration in Online Education to Bridge the Gender Gap in Higher Education

The results indicate that 68.34% of respondents (Agree & Strongly Agree) believe blockchain technology in online education can help reduce gender disparities in higher education by improving accessibility for women. 18.33% remained neutral, reflecting a degree of uncertainty regarding its effectiveness. Meanwhile, 13.33% (Strongly Disagree & Disagree) do not see blockchain as a key factor in bridging the gender gap. These findings suggest that blockchain has strong potential to support gender-inclusive educational opportunities, but further efforts are needed to raise awareness and address implementation challenges.

Discussion

The integration of blockchain technology in online education, particularly for women in developing societies, presents several promising opportunities for addressing gender disparities in higher education. Based on the survey results, a significant portion of the respondents (68.34%) agreed or strongly agreed that blockchain could contribute to bridging the gender gap in education. This reflects growing recognition of blockchain's potential to offer women more equitable access to educational resources, especially in regions where traditional educational systems may have barriers such as high costs, lack of trust, or limited access to credential verification.

Blockchain's key advantages in this context lie in its ability to provide secure, transparent, and tamper-proof educational credentials, which could enhance the recognition of women's academic achievements in a global context. This is especially important for women in developing countries, where societal norms or institutional biases may prevent them from having their educational qualifications recognized. As blockchain allows for decentralized verification of credentials, women would no longer have to rely solely on centralized authorities that may have their own biases or limitations. This could lead to increased trust in their qualifications and open doors for better employment opportunities (Kamath, 2018; Tang, 2022).

Moreover, blockchain technology could play a critical role in promoting financial independence for women. Blockchain-based financial services, such as decentralized finance (DeFi) and digital wallets, allow women to manage their finances without the intermediaries often found in traditional financial systems. This feature is particularly relevant for women in developing societies, where limited access to financial institutions and gendered financial exclusion are pervasive (Thylin & Duarte, 2019; Frizzo-Barker, 2020). These financial systems can empower women by giving them control over their financial assets, enabling them to save, invest, and participate in the economy in previously unavailable ways.

However, it is important to note that there are significant challenges to the widespread adoption of blockchain in education. High implementation costs, limited awareness, and technological infrastructure gaps are some of the key barriers identified in the literature (Rahman et al., 2022; Isaacs et al., 2022). The survey results also reflect this concern, as some respondents (13.33%) felt these costs would hinder blockchain's adoption in online education. While blockchain has the potential to democratize education and finance, its costs and

complexity remain significant obstacles. These barriers must be addressed through policy interventions, partnerships, and investment in technological infrastructure to ensure that blockchain is accessible to all women, especially in low-resource settings.

Conclusion

This research has highlighted the significant potential of blockchain technology in empowering women in developing societies, particularly in secure digital identity access, financial independence, and education. Blockchain's decentralized and transparent nature offers enhanced trust, allowing women more control over their digital identities and financial resources, thus providing them with economic and social participation opportunities. The findings suggest that blockchain integration can contribute to bridging the gender gap in education and finance by enabling women to access educational credentials and financial services without the barriers posed by traditional systems.

However, the adoption of blockchain faces challenges, particularly regarding high implementation costs, technological infrastructure limitations, and lack of awareness. Despite these barriers, blockchain's potential to empower women in underserved regions cannot be overlooked. The results from the survey indicate a strong interest in leveraging blockchain for educational credentials, financial inclusion, and transparent property rights, with significant agreement among respondents on its transformative potential. Nevertheless, wider adoption will require tackling both technological and economic challenges.

Recommendations

1) To fully harness the potential of blockchain for women's empowerment, the following recommendations are proposed:
2) Policy Support: To reduce implementation costs, governments and institutions should create favourable policies and invest in blockchain infrastructure, particularly in developing countries.
3) Awareness Campaigns: Efforts should be made to raise awareness of blockchain's benefits among women and educational institutions.
4) Collaboration with Tech Industry: Educational and financial institutions should collaborate with the blockchain industry to develop affordable, scalable solutions that address local needs.

Future Research

Future research should focus on real-world case studies that assess the implementation of blockchain in women-centric initiatives, such as financial inclusion and education. Additionally, exploring cost-effective solutions and public-private partnerships to overcome blockchain's high implementation costs will be critical. Comparative studies between blockchain and traditional systems in terms of impact on gender equality, especially in marginalized communities, will also provide valuable insights. Finally, future studies should

investigate the long-term impact of blockchain on women's economic empowerment, particularly in areas such as employment rates, entrepreneurship, and financial literacy.

Declaration of conflicting interest

The authors declare that there is no conflict of interest in this work.

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