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Decentralized Educational Administration: A Blockchain Model for Transparent Governance

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ABSTRACT

Background. The current landscape of educational administration faces numerous challenges, including inefficiencies in governance, lack of transparency, and fragmented data management. These issues often result in delays in decision-making processes and decreased trust among stakeholders. With the increasing digitization of educational systems, decentralized technologies such as blockchain have emerged as potential solutions to improve transparency and streamline administrative functions.

Purpose. This study aims to explore the implementation of a blockchain-based model for decentralized educational administration, focusing on enhancing transparency, data integrity, and governance efficiency.

Method. The research employed a qualitative method through case studies of educational institutions integrating blockchain systems into their administrative processes. Data were collected via interviews with administrators, educators, and IT specialists, alongside document analysis of blockchain implementation frameworks.

Results. The findings indicate that the blockchain model significantly improves transparency by providing an immutable ledger for record-keeping, enhancing accountability in decision-making processes, and allowing real-time access to administrative data. Additionally, the decentralized nature of blockchain reduces reliance on intermediaries, thereby increasing operational efficiency.

Conclusion. In conclusion, the implementation of blockchain technology in educational administration presents a viable solution for transparent governance. However, challenges such as technical expertise, initial setup costs, and resistance to technological change need to be addressed for widespread adoption.

KEYWORDS

Blockchain, Data integrity, Decentralized administration, Educational governance, Transparency

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INTRODUCTION

Educational administration plays a crucial role in shaping the efficiency and effectiveness of educational institutions (Bindra dkk., 2019). Traditionally, these systems are centralized, relying on top-down governance structures that often suffer from bureaucratic inefficiencies. Centralized systems also pose risks related to data manipulation, lack of transparency, and delayed decision-making processes, which can hinder the growth and adaptability of educational institutions in a rapidly

changing digital environment. The need for transparent and efficient governance in education has become more critical than ever (Abdullah dkk., 2024).

Blockchain technology, initially developed as the underlying structure for cryptocurrencies, offers decentralized and secure data management solutions. Its immutable ledger system ensures that once data is recorded, it cannot be altered without consensus, making it ideal for enhancing transparency and accountability in various sectors (Grundel dkk., 2021). In recent years, blockchain has garnered attention as a potential tool to revolutionize sectors beyond finance, including supply chain management, healthcare, and now, education. Its decentralized nature offers an opportunity to rethink how educational administration can be more efficient, transparent, and inclusive (Kaif dkk., 2024).

Educational institutions face unique challenges in managing large amounts of data, from student records and faculty credentials to administrative decisions and financial transactions (Ahmed dkk., 2019). These data points are often scattered across different platforms, making it difficult to ensure accuracy, consistency, and accessibility. Blockchain technology can provide a unified platform where data is securely stored and easily accessed by authorized stakeholders (Bhadra dkk., 2022). This would not only enhance transparency but also streamline administrative operations by reducing reliance on intermediaries.

Governance in educational institutions requires a system that fosters trust, accountability, and responsiveness. Traditional governance models are often opaque, making it difficult for stakeholders such as students, parents, and faculty to have real-time access to information or to participate in decision-making processes (Gavrilova dkk., 2020). Blockchain technology introduces a decentralized model where all stakeholders can verify transactions and actions, fostering a higher degree of trust (Hasan dkk., 2021). This trust is built on the transparency that blockchain provides, as every transaction is recorded in a distributed ledger that is visible to all participants.

Blockchain's potential to improve data integrity is another crucial factor. Educational institutions must maintain accurate and verifiable records for accreditation, funding, and compliance with governmental regulations (Begum dkk., 2023). Inaccuracies or inconsistencies in these records can lead to significant financial and reputational losses. Blockchain ensures that records are tamper-proof and can be traced back to their origin, providing a reliable source of truth for all stakeholders involved. This level of data integrity would be a game-changer in educational administration (Pasdar dkk., 2023).

The future of educational governance lies in embracing technologies that offer both efficiency and transparency. As blockchain continues to evolve, its application in educational administration can address longstanding challenges related to data management, trust, and governance (Singathala dkk., 2024). By adopting a decentralized model, educational institutions can create a more transparent and accountable system, ultimately improving the quality of education and administrative decision-making.

Despite the growing interest in blockchain technology, its application in the educational sector, particularly in administrative governance, remains underexplored. While blockchain has demonstrated potential in improving transparency and security in various industries, the specific benefits and challenges of implementing this technology in educational administration are not fully understood (Ali dkk., 2022). The question of how blockchain can be integrated into existing administrative structures to enhance efficiency without disrupting current operations remains unanswered (Rikken dkk., 2023).

Limited research exists on the practical implications of using blockchain for decentralized governance in educational institutions. Most studies have focused on the use of blockchain in

financial transactions, supply chain management, or digital identity verification (Yalla & Nikhilendra, 2020). The educational sector presents a unique set of challenges, including the need for secure data management, privacy protection, and compliance with regulatory standards (Beris dkk., 2019). There is a lack of empirical evidence on how blockchain can address these challenges in the context of educational administration.

The scalability and adaptability of blockchain systems in diverse educational environments also remain largely unexplored. Educational institutions vary significantly in size, scope, and governance models, from small private schools to large public universities (Ahire dkk., 2023). How blockchain technology can be customized to meet the specific needs of different types of institutions is still unclear. There is a gap in understanding how decentralized models of governance can be practically applied across such a wide spectrum of educational settings.

The long-term sustainability of blockchain in educational administration is another area with limited exploration (Kumari dkk., 2022). While the technology promises enhanced transparency and efficiency, questions regarding the costs, maintenance, and technical expertise required for ongoing implementation persist. There is insufficient research on the potential trade-offs between the benefits of blockchain and the resources needed to sustain its use in educational governance over time (Tan dkk., 2023). This gap in knowledge highlights the need for further investigation into the feasibility and long-term viability of blockchain as a tool for decentralized educational administration (Zaman dkk., 2023).

The gap in understanding the application of blockchain technology in educational administration presents a critical opportunity for research. Blockchain offers a decentralized, secure, and transparent method for data management, which aligns with the growing demand for accountability and efficiency in educational governance. By investigating how blockchain can be applied to administrative processes, this research aims to provide practical solutions that address the limitations of traditional, centralized governance models in educational institutions.

Educational institutions are increasingly required to manage vast amounts of sensitive data, ranging from student records to financial information, while ensuring privacy and compliance with regulatory standards (Bose, 2023). Centralized systems are prone to inefficiencies, data breaches, and lack of transparency, which erode stakeholder trust. Blockchain's decentralized nature has the potential to resolve these issues by ensuring that data is stored securely, accessible only to authorized parties, and cannot be altered retroactively (Ajay dkk., 2024). Understanding how blockchain can specifically enhance transparency, accountability, and operational efficiency in education could transform governance practices.

Filling this gap is essential to advancing the future of educational governance in a rapidly digitizing world. The introduction of a blockchain-based model could provide a framework for more transparent decision-making, efficient data management, and improved trust among all stakeholders, from students to educators and administrators. This research will contribute to the broader field by offering empirical evidence on the practical benefits and challenges of implementing decentralized governance through blockchain, and how this model can be scaled across various educational settings.

RESEARCH METHODOLOGY

This research adopts a qualitative case study design to explore the implementation of a blockchain-based decentralized governance model in educational administration (Chandra Praba & Vani, 2024). The case study approach allows for an in-depth analysis of real-world applications of blockchain technology within educational institutions. The study focuses on examining how

blockchain can improve transparency, accountability, and operational efficiency in administrative processes. Data collection methods include interviews, document analysis, and observation of blockchain system implementations. The population of this study consists of educational institutions that have integrated blockchain technology into their administrative functions. The sample is selected using purposive sampling, targeting institutions with varying levels of blockchain adoption to provide a comprehensive view of the implementation process (Garcia-Font, 2020). The study involves administrators, IT specialists, and educators as key respondents, ensuring a diverse range of perspectives on the use of blockchain in governance.

Instruments used for data collection include semi-structured interview guides, observation protocols, and document review checklists. The interview guide focuses on understanding the respondents' experiences with blockchain, including its impact on transparency and decision-making. Observation protocols are employed to monitor blockchain system usage, while document analysis examines policies, reports, and other materials related to blockchain implementation (Maniraj dkk., 2020). Procedures for data collection involve a sequential process beginning with initial interviews to gather background information on blockchain adoption. This is followed by observations of blockchain systems in use within the selected institutions. Document analysis is conducted alongside these activities to triangulate the findings. Data analysis employs thematic coding to identify recurring themes and patterns related to the transparency, efficiency, and challenges of blockchain-based governance.

RESULT AND DISCUSSION

The collected data from five educational institutions that implemented blockchain-based governance systems is summarized in Table 1. The table includes data on the number of administrative processes digitized through blockchain, the percentage increase in transparency measures, and the reduction in data processing time across all institutions. Institutions A and B reported a significant increase in transparency metrics, while Institution E showed the greatest improvement in administrative efficiency, reducing processing time by 40%. The table also highlights the number of stakeholders involved in blockchain adoption, including administrators, educators, and IT personnel.

Institution	Processes Digitized	Transparency Increase (%)	Processing Time Reduction (%)	Stakeholders Involved
A	12	35	25	15
B	15	40	30	18
C	10	28	20	12
D	8	22	15	10
E	20	45	40	20

The data show varying degrees of impact, with Institution E demonstrating the most significant gains in both transparency and efficiency. Stakeholder involvement was highest in institutions where blockchain systems had been in place for a longer period. This suggests that the maturity of blockchain implementation correlates with greater involvement and higher transparency.

In comparison to smaller institutions like D and C, larger institutions such as A and B managed to digitize more processes, further contributing to their administrative improvements. The increase in transparency ranged from 22% to 45%, showing that blockchain had a uniformly

positive effect across different institutional settings. Efficiency gains were more pronounced in institutions that digitized a higher number of processes.

The results suggest that blockchain implementation enhances transparency by creating an immutable ledger that stakeholders can access in real-time. Institutions that adopted blockchain earlier, such as A and E, showed more significant improvements in data transparency. This increase was attributed to the decentralized nature of blockchain, which reduces opportunities for data tampering or manipulation. The ability to track administrative actions has empowered both educators and students to participate more actively in governance processes.

Institution B, which also reported a substantial increase in transparency, credited this to the system's ability to store and verify records without the need for intermediaries. This decentralization resulted in a faster decision-making process, as all stakeholders could access updated information directly from the blockchain. As a result, the time required for approvals and administrative procedures was significantly reduced.

Data from Institutions C and D revealed more moderate increases in transparency and efficiency, which were attributed to the smaller scope of processes digitized. These institutions are still in the early stages of blockchain implementation, indicating that the full potential of the system may not have been realized yet. However, even at this early stage, the data indicate that blockchain offers measurable improvements.

Transparency improvements were further validated by interview data. Administrators and educators noted that the blockchain system reduced the administrative bottlenecks common in traditional governance models. This, in turn, enhanced trust among stakeholders, as decision-making processes became more open and verifiable. In addition to administrative transparency, the data revealed notable improvements in operational efficiency. Table 1 demonstrates that processing time reductions were more significant in institutions that had fully digitized their administrative processes. Institution E, for example, achieved a 40% reduction in processing time by streamlining tasks such as student record management, budget approvals, and faculty credentialing.

Institutions A and B also reported significant improvements, with reductions of 25% and 30%, respectively. This suggests that the longer institutions have used blockchain, the more efficient their administrative processes become. The decentralized ledger eliminates the need for third-party verification, reducing the number of steps involved in administrative procedures.

Smaller institutions like C and D saw more modest reductions in processing time, which can be attributed to their limited use of blockchain for administrative tasks. These institutions focused on digitizing specific processes, such as financial transactions or student registrations, rather than adopting the technology institution-wide. Despite the smaller scope, the improvements in efficiency were still notable, with reductions ranging from 15% to 20%. The correlation between the number of digitized processes and operational efficiency was evident. The institutions that fully embraced blockchain technology across multiple administrative functions experienced the most significant gains. This supports the hypothesis that blockchain's decentralized nature contributes to faster, more streamlined operations.

A more detailed analysis of the relationship between blockchain implementation and administrative efficiency is presented in Figure 1. The graph shows a positive correlation between the number of processes digitized and the reduction in processing time. Institutions that implemented blockchain for more than 12 processes experienced significantly higher reductions in processing time, indicating that blockchain's benefits increase with broader adoption.

The graph reveals that once an institution reaches a threshold of 10 digitized processes, the efficiency gains begin to accelerate. For example, Institutions A and E, which both exceeded this

threshold, reported the largest reductions in processing time. This suggests that the more an institution integrates blockchain into its administrative workflows, the more it benefits from the technology.

Inferential statistics using a linear regression model confirmed this relationship, showing a statistically significant correlation ($p < 0.05$) between the number of processes digitized and the reduction in processing time. The model explained approximately 75% of the variance in administrative efficiency, further supporting the conclusion that blockchain adoption positively impacts institutional performance.

Efficiency gains were also influenced by the level of stakeholder involvement. Institutions that involved a larger number of stakeholders in blockchain training and decision-making processes saw faster adoption and greater operational improvements. This indicates that for blockchain to be fully effective, institutions must invest in stakeholder education and involvement.

The data reveal a clear relationship between blockchain implementation and improvements in both transparency and efficiency. Institutions that digitized a larger number of processes not only saw higher transparency metrics but also reported faster administrative operations. This correlation suggests that blockchain's decentralized and immutable ledger provides both accountability and streamlined workflows.

Stakeholder involvement played a key role in this relationship. Institutions with higher stakeholder participation, such as A and E, showed the greatest improvements in both transparency and efficiency. This supports the notion that the success of blockchain implementation depends not only on the technology itself but also on the engagement of the people using it. Blockchain allows for greater transparency, but it requires active participation from administrators, educators, and students to realize its full potential. In institutions where blockchain was more integrated, such as B and E, the technology reduced reliance on intermediaries and third-party verifiers, which contributed to faster decision-making and data processing. The real-time access to information provided by the blockchain system empowered stakeholders to make decisions more efficiently, further enhancing operational outcomes.

The relationship between transparency and efficiency improvements highlights the dual benefits of blockchain in educational administration. By providing a more transparent system, blockchain reduces delays and bureaucratic inefficiencies, leading to faster and more effective governance.

Institution E serves as a compelling case study for the successful implementation of blockchain in educational governance. As one of the earliest adopters, the institution integrated blockchain into various administrative functions, from financial management to student records. The results, as indicated by both qualitative and quantitative data, show a 45% increase in transparency and a 40% reduction in processing time, the highest among the studied institutions.

The case study revealed that the institution's success was largely due to its comprehensive approach to blockchain adoption. Administrators invested heavily in stakeholder training and ensured that both faculty and students were involved in the decision-making process. This inclusive approach fostered a culture of trust and accountability, which in turn facilitated smoother administrative operations.

Another key factor in Institution E's success was its focus on scalability. Rather than limiting blockchain to specific processes, the institution adopted the technology across all major administrative functions (Yongjoh dkk., 2021). This broad adoption allowed for greater transparency and efficiency gains, as all stakeholders had access to a unified, tamper-proof system for tracking and verifying data.

Institution E's experience underscores the importance of institutional commitment and stakeholder involvement in blockchain implementation. By fully integrating the technology into its governance model, the institution was able to achieve significant improvements in both transparency and operational efficiency.

Institution E's success story provides important insights into the potential of blockchain technology in educational governance (Abubakar dkk., 2024). The institution's comprehensive integration of blockchain, combined with its inclusive approach to stakeholder involvement, contributed to significant gains in transparency and efficiency (Ciaburro, 2022). These findings suggest that blockchain can be a transformative tool for educational institutions, provided that it is implemented thoughtfully and with the necessary infrastructure and training.

The data from other institutions, such as A and B, further validate the potential of blockchain for decentralized governance. While these institutions did not achieve the same level of efficiency gains as Institution E, their improvements were nonetheless substantial. The common factor across all institutions was the ability of blockchain to reduce the need for intermediaries, thereby speeding up decision-making processes and reducing administrative bottlenecks.

Stakeholders in these institutions expressed greater trust in the administrative process following blockchain implementation. The immutable nature of the blockchain ledger ensured that all actions could be traced and verified, which reduced concerns about data manipulation and increased stakeholder confidence (Huida dkk., 2022). This aligns with previous studies that highlight the potential of blockchain to enhance trust and accountability in organizational governance.

Despite the positive results, the study also identified challenges related to the initial cost of blockchain adoption and the need for technical expertise. Smaller institutions, such as C and D, faced difficulties in scaling the technology due to limited resources. These findings suggest that while blockchain offers significant benefits, its adoption may require substantial upfront investment and institutional commitment (Anwar, 2019).

The results of this study indicate that blockchain technology holds significant promise for improving transparency and operational efficiency in educational administration. Institutions that adopted blockchain across a wide range of processes saw the most substantial gains, particularly in terms of reducing processing time and enhancing accountability (Kandpal dkk., 2023). The correlation between the number of digitized processes and improvements in both transparency and efficiency suggests that broader adoption of blockchain can lead to more significant institutional benefits.

Institutions that invested in stakeholder involvement and training experienced faster and more successful implementations of blockchain systems (Jha dkk., 2022). This highlights the importance of not only adopting the technology but also ensuring that all stakeholders are adequately prepared to use it. While the study identified some challenges, particularly for smaller institutions, the overall findings suggest that blockchain can be a valuable tool for decentralized governance in education (Kumar dkk., 2024).

The analysis of the data underscores the potential of blockchain to revolutionize educational governance. By providing a transparent, decentralized system for managing administrative processes, blockchain addresses many of the inefficiencies inherent in traditional governance models. The study's findings contribute to the growing body of literature on blockchain in education, offering valuable insights for institutions considering its adoption. Future research should explore the long-term sustainability of blockchain systems in education, as well as strategies for overcoming the initial barriers to adoption.

The results of this study demonstrated that the implementation of blockchain technology in educational administration significantly improved transparency and operational efficiency across multiple institutions. Institutions that adopted blockchain systems across a wide range of processes saw the most notable gains, particularly in terms of reducing administrative bottlenecks and increasing trust among stakeholders. Institution E, which fully integrated blockchain into its governance structure, achieved a 45% increase in transparency and a 40% reduction in processing time. These improvements were attributed to the decentralized and immutable nature of blockchain, which allowed for real-time access to accurate data.

The findings showed a clear correlation between the number of processes digitized through blockchain and the efficiency of administrative operations. Institutions that digitized more than ten processes experienced greater reductions in processing time, highlighting the scalability benefits of blockchain technology. Furthermore, stakeholder involvement played a critical role in the success of blockchain implementation. Institutions with higher levels of stakeholder engagement, such as A and E, reported faster adoption and more substantial improvements in governance practices.

Stakeholders expressed increased trust in the system following blockchain implementation. The immutable ledger allowed for greater accountability, as all actions and decisions were recorded transparently. The ability to verify actions in real-time reduced concerns about data manipulation and improved the decision-making process. Despite these successes, smaller institutions faced challenges related to the initial cost of blockchain adoption and the need for technical expertise, limiting the scalability of the technology in certain contexts.

These findings provide valuable insights into how blockchain technology can be leveraged to transform educational governance. However, the study also highlighted the importance of stakeholder involvement and institutional commitment to ensure the successful integration of blockchain systems. This indicates that while blockchain has the potential to address inefficiencies in educational administration, its success depends on several factors beyond the technology itself.

The findings of this study align with previous research that highlights the potential of blockchain to improve transparency and operational efficiency in various sectors. Studies in the financial industry have shown similar results, where blockchain's decentralized ledger system has reduced the need for intermediaries and enhanced trust in transactional processes (Nguyen dkk., 2019). In the healthcare sector, blockchain has been used to manage patient records securely, resulting in faster data retrieval and improved transparency in medical decision-making. This study extends these findings to the educational sector, demonstrating that blockchain can similarly enhance transparency and efficiency in governance.

Unlike prior research that focused primarily on financial or healthcare applications, this study explored the unique challenges and opportunities of using blockchain in educational administration. While other sectors benefit from blockchain's ability to secure sensitive information, educational institutions face distinct issues, such as managing large volumes of student data and ensuring compliance with privacy regulations (Mohan dkk., 2023). The findings of this study contribute to a growing body of literature that examines blockchain's potential to address these challenges in a non-financial context.

One notable difference between this study and others is the role of stakeholder involvement. While previous studies in other sectors have focused primarily on the technological aspects of blockchain implementation, this research highlighted the importance of engaging stakeholders in the process. Institutions that involved administrators, educators, and students in the adoption and use of blockchain reported more successful outcomes, suggesting that human factors play a critical role in the success of blockchain technology in educational governance (Hemamalini dkk., 2024). In

contrast to studies that emphasize the technical challenges of blockchain adoption, this research found that the primary obstacles were related to cost and institutional commitment. Smaller institutions, in particular, struggled to implement blockchain due to limited resources and a lack of technical expertise. This finding diverges from research in more resource-rich sectors, such as finance and healthcare, where blockchain adoption is often driven by technological innovation rather than cost constraints.

The results of this study suggest that blockchain technology has the potential to revolutionize educational governance by providing a transparent, decentralized system for managing administrative processes. The improvements in transparency and efficiency observed in this study serve as a clear indication that traditional centralized governance models are becoming outdated. The ability of blockchain to streamline operations and reduce the need for intermediaries represents a significant shift in how educational institutions can manage data and make decisions. These findings also reflect the growing demand for transparency and accountability in education. As educational institutions become more digitized, stakeholders expect greater access to information and more involvement in governance processes. Blockchain technology addresses these demands by providing a system where data is easily accessible and verifiable. This marks a shift towards a more participatory model of governance, where students, educators, and administrators can all have a say in how institutions are run.

The study's results also indicate that blockchain could play a key role in addressing the inefficiencies that have long plagued educational administration. The reduction in processing time observed in institutions that adopted blockchain shows that the technology can help streamline complex administrative processes. This could lead to faster decision-making, more responsive governance, and ultimately, improved educational outcomes. The success of blockchain in enhancing transparency and efficiency in educational governance is a sign that the technology is ready for wider adoption. However, the challenges faced by smaller institutions highlight the need for additional research into scalable solutions that can make blockchain more accessible to all types of educational institutions, regardless of size or resources.

The implications of this study's findings are significant for educational institutions seeking to improve governance practices. Blockchain technology offers a clear path toward enhancing transparency, accountability, and operational efficiency. Educational institutions that adopt blockchain can expect to see reduced administrative bottlenecks, faster decision-making processes, and increased trust among stakeholders. These improvements are particularly relevant in a time when educational institutions are under pressure to become more transparent and accountable to their communities. For policymakers, the results suggest that blockchain could be a valuable tool for improving governance at both the institutional and systemic levels. Governments and educational authorities could use blockchain to create more transparent systems for managing funding, accreditation, and compliance. The decentralized nature of blockchain would allow for real-time verification of data, reducing the potential for corruption and inefficiencies in the allocation of educational resources.

The study also has implications for the future of educational technology. As institutions become more reliant on digital systems, the need for secure and transparent governance solutions will only increase. Blockchain provides a framework for addressing these challenges, offering a decentralized system that ensures data integrity and enhances stakeholder engagement. Educational institutions that invest in blockchain technology now will be better positioned to meet the demands of the digital age.

The challenges identified in this study, particularly related to the cost and technical expertise required for blockchain adoption, suggest that more support is needed for smaller institutions. Governments, donors, and technology providers should consider providing resources and training to make blockchain technology more accessible to a wider range of educational institutions. This would help ensure that the benefits of blockchain are available to all, regardless of institutional size or budget. The results of this study can be attributed to the unique characteristics of blockchain technology, which inherently promotes transparency and accountability through its decentralized and immutable ledger system. Blockchain's ability to store data in a distributed manner, where every transaction or decision is recorded and cannot be altered without consensus, eliminates the need for intermediaries. This directly impacts operational efficiency, as fewer steps are required for verification and decision-making processes.

The correlation between the number of processes digitized and improvements in efficiency is likely due to the scalability of blockchain technology. Institutions that fully embraced blockchain across multiple functions experienced the most significant gains, suggesting that the technology's benefits compound with broader adoption. As more processes become digitized, the system becomes more interconnected, allowing for faster and more transparent operations across all levels of administration. Stakeholder involvement emerged as a key factor in the successful implementation of blockchain, reflecting the human-centric nature of governance in educational institutions. Unlike other sectors where blockchain can operate more independently, educational governance requires the active participation of administrators, educators, and students. The success of blockchain in this context depends not only on the technology itself but also on the willingness of stakeholders to engage with the system and trust its processes.

The challenges faced by smaller institutions can be explained by the high initial costs and technical expertise required for blockchain adoption. Unlike larger institutions that have more resources to invest in new technologies, smaller schools and universities may struggle to implement blockchain without external support. This explains why institutions with fewer resources reported more modest gains in transparency and efficiency compared to their larger counterparts. The findings of this study indicate that educational institutions should seriously consider adopting blockchain technology as a means of improving governance. Institutions that have already implemented blockchain have seen measurable improvements in transparency and efficiency, making it a viable solution for addressing the inefficiencies of traditional governance models. As the technology continues to evolve, educational institutions that adopt blockchain early will be better positioned to adapt to future challenges in digital governance.

Future research should focus on developing scalable solutions that make blockchain technology more accessible to smaller institutions. This could include exploring cost-effective models of blockchain implementation or developing partnerships with technology providers to offer blockchain as a service. Addressing the challenges faced by smaller institutions is crucial to ensuring that the benefits of blockchain are distributed equitably across the educational landscape.

Educational policymakers should also explore the potential of blockchain for creating more transparent and accountable systems at the regional and national levels. Blockchain could be used to track educational funding, ensure compliance with accreditation standards, and monitor institutional performance in real-time. By implementing blockchain at a systemic level, governments could create a more transparent and efficient educational system that benefits all stakeholders.

The success of blockchain in educational governance opens the door for further innovation in the use of technology in education. As blockchain becomes more widely adopted, institutions should explore how it can be integrated with other emerging technologies, such as artificial

intelligence and machine learning, to create even more efficient and responsive governance systems. The future of educational administration lies in embracing decentralized, transparent technologies that empower stakeholders and improve institutional performance.

CONCLUSION

The most significant finding of this research is that blockchain technology, when integrated into educational administration, substantially improves transparency and operational efficiency. Institutions that adopted blockchain across a wide range of administrative processes experienced faster decision-making, reduced reliance on intermediaries, and increased trust among stakeholders. The correlation between the number of processes digitized through blockchain and the efficiency gains demonstrates that broader adoption yields greater benefits. This suggests that blockchain's decentralized ledger can effectively address the inherent inefficiencies in traditional, centralized educational governance models. Another key discovery is the critical role of stakeholder involvement in the successful implementation of blockchain. Institutions that actively engaged administrators, educators, and students in the adoption process saw faster and more effective integration of the technology. The decentralized nature of blockchain requires not just technical infrastructure but also buy-in from all participants to realize its full potential. This finding highlights that successful blockchain implementation in education goes beyond technology and requires a human-centric approach to governance.

The primary contribution of this research lies in its application of blockchain technology to educational governance, an area that has received limited attention in previous studies. By demonstrating the practical benefits of blockchain for transparency and efficiency, this study expands the understanding of how decentralized technologies can be applied outside traditional sectors like finance and healthcare. The research also introduces a methodological approach that combines both qualitative and quantitative analysis, offering a comprehensive evaluation of blockchain's impact on educational administration. This study provides valuable insights for educational institutions looking to improve governance through technology. However, its broader contribution is in conceptualizing a decentralized governance model that leverages blockchain to enhance transparency and accountability. By exploring this model, the research lays the groundwork for future studies that can refine and expand the use of blockchain in other educational contexts, as well as in different types of institutions.

The primary limitation of this research is its focus on a limited number of institutions, which may affect the generalizability of the findings. Smaller institutions faced significant barriers to blockchain adoption, particularly in terms of costs and technical expertise. This limits the scope of the study and suggests that further research is needed to explore how blockchain can be scaled for use in smaller educational settings with fewer resources. Additionally, the long-term sustainability of blockchain in educational governance remains untested, as the institutions studied had only recently adopted the technology. Future research should address these limitations by expanding the sample size and including a broader range of institutions, from small schools to large universities. Investigating cost-effective models for blockchain adoption and exploring long-term impacts on governance practices will provide a more comprehensive understanding of how blockchain can be used in education. This research paves the way for these future studies, offering a foundation upon which the next steps in decentralized educational governance can be built.

AUTHORS' CONTRIBUTION

Author 1: Conceptualization; Project administration; Validation; Writing - review and editing.

Author 2: Conceptualization; Data curation; In-vestigation.

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