Integration of Blockchain Technology in Education Financial Management for Transparency and Accountability

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ABSTRACT

The education system requires transparent and accountable financial management to ensure efficiency, fairness and sustainability. However, there are still many challenges in achieving this, especially related to limited transparency and reliability of financial data. Blockchain technology offers the potential to increase transparency and accountability in educational financial management by providing proof of authentication and an immutable track record. This research aims to explore the potential for integrating blockchain technology in educational financial management to increase transparency and accountability. Researchers also aim to analyze its impact on efficiency and fairness in the education system. This research method uses a qualitative approach with literature study and case analysis. Researchers analyzed literature related to blockchain technology in the context of educational financial management, and collected data from case studies of blockchain technology implementation in educational institutions that have adopted it. The research results show that the integration of blockchain technology in educational financial management can increase transparency and accountability by providing immutable proof of authentication for every financial transaction. In addition, the use of blockchain technology can increase the efficiency of financial administration processes and minimize the risk of fraud or data manipulation. The conclusion of this research is that the integration of blockchain technology in educational financial management has great potential to increase transparency, accountability and efficiency in the education system. However, challenges related to infrastructure availability and technical understanding need to be overcome to optimize its benefits. Therefore, strategic and collaborative steps from related parties are needed to encourage widespread adoption of this technology in educational financial management.

Keywords: Blockchain Technology, Financial Management, Education, Transparency, Accountability.
INTRODUCTION

Education is one of the main pillars in a country's development, where financial management is crucial to maintaining the continuity and quality of the education system itself. Effective, transparent and accountable education financial management ensures that funds allocated for education are used appropriately (Meyliana et al., 2020), support a quality learning process, and have a positive impact on community development (Al-Said et al., 2023). Educational financial management is a vital aspect in maintaining the continuity and quality of a country's education system (Edinboro & Brady, 2022). Education funds originating from various sources, whether government, private or donations, must be managed efficiently, transparently and accountably in order to have a impact on educational development (Alnafrah & Mouselli, 2021). However, major challenges often arise in achieving these goals, with issues of transparency and accountability becoming a pressing focus of attention (Abu Bakar et al., 2023). The aim of educational financial management is to ensure that the financial resources available for education are used effectively, efficiently and transparently to support the achievement of set educational goals (AlDhaen, 2022).

In many countries, educational financial management is often faced with the inverted pyramid problem (Agarwal et al., 2022). This phenomenon is characterized by lack of clarity in the flow of funds, lack of transparency in expenditure policies, and minimal accountability for the use of education funds (Amitkumar et al., 2021). These problems include a variety of things, from complicated administration to the risk of misuse of funds (Alshareef & Akhtar, 2023). Educational institutions, be they schools, universities or other educational institutions, often have difficulty ensuring that any funds used are used efficiently and in accordance with educational goals (Razia & Awwad, 2022). This challenge is becoming increasingly complicated with the increasing complexity in modern education systems (Alshareef, 2022). Changes in educational needs, changing regulations, and demands to provide accurate financial reports are increasing the pressure on educational institutions to manage their finances efficiently and transparently (Brown, 2022). Therefore, innovative and effective solutions are needed to overcome this problem, which enable educational institutions to increase transparency and accountability in their financial management (Kumar et al., 2022).

This research aims to explore the potential for integrating blockchain technology in educational financial management to increase transparency and accountability (Alnafrah & Mouselli, 2021). By leveraging the unique features of blockchain technology, such as decentralization, security, and immutable track record
(Anjana & Mukerji, 2023), this research aims to identify how blockchain technology can be applied in the context of educational financial management to achieve these goals (Bucea-Manea-Țoniș et al., 2021). This research is important because it tries to overcome the problems that are the main obstacles in managing educational finances (G. Chen et al., 2018). By increasing transparency and accountability, it is hoped that it can improve efficiency in financial management (Department Of Computer Engineering, Marthwada Mitra Mandal’s College Of Engineering, Pune. et al., 2019), reduce the risk of misuse of funds, and increase public trust in educational institutions (Cai & Gao, 2020). Apart from that, this research can also contribute to the development of blockchain technology in the educational context, which is currently still relatively new and has not yet been fully utilized widely (Mulyati et al., 2021).

According to Dudhat et al., (2021), with the research title Blockchain in Indonesia University: A Design Viewboard of Digital Technology Education. The results of his research stated that This ongoing project is in the process of evaluation. Conforming to some design elements as well as experimental implementation in the context of higher education enables us to further indicate the sustainability and relevance of the application of blockchain technology in education. The second research according to Machado et al., (2020), with the research title Blockchain Technology in Education. The results of his research stated that related to the innovative applications of blockchain technology to getting a diploma, to the assessment, and formative evaluation, but also related to the learning activities design and implementation, and how to keep tracking the whole learning processes in a distributive way, preventing frauds and facilitating the educational management process. The third research according to Yadav et al., (2021), with the research title Significance and Impact of Blockchain Technology in Education System. The results of his research stated that Blockchain-based repository manages and distributes the educational assets like e-certificates, identification documents among the academic professionals, and allows these educational assets to be securely transferred, shared, and distributed by the various parties.

Meanwhile, in the researcher's research entitled Integration of Blockchain Technology in Education Financial Management for Transparency and Accountability, the researcher stated that the integration of blockchain technology in educational financial management can increase transparency and accountability by providing immutable proof of authentication for every financial transaction. In addition, the use of blockchain technology can increase the efficiency of financial administration processes and minimize the risk of fraud or data manipulation (Agarwal et al., 2021). To achieve the research objectives the researcher will use a qualitative approach involving literature study and case analysis (Zhao, 2023). Researchers will collect data from various literature sources, including scientific journals, books, and research reports related to blockchain technology and educational financial management (Woodside et al., 2017). Apart from that, researchers will also conduct case analyzes of educational institutions that have implemented blockchain technology in their financial
management (Srivastava & Dashora, 2022). By combining this approach researchers will be able to gain a comprehensive understanding of the potential and challenges in adopting blockchain technology in educational financial management.

RESEARCH METHODOLOGY

Research design
This research uses a qualitative approach with a focus on case studies and literature analysis (Banihashem et al., 2018). A qualitative approach was chosen because it allows researchers to understand in depth the implementation of blockchain technology in educational financial management and its impact on transparency and accountability (Smith & Firth, 2011). Case studies are used to analyze the implementation of blockchain technology in educational institutions that have adopted it, while literature analysis is carried out to understand related theories, concepts and trends.

Research procedure
The research procedure began with collecting data from various literature sources, including scientific journals, books, and research reports related to blockchain technology and educational financial management. Next, the researcher conducted an analysis of the literature to identify the conceptual framework and important findings related to the integration of blockchain technology in educational financial management (Verde et al., 2019). Next, the researchers conducted a case study of educational institutions that have adopted blockchain technology in their financial management. This procedure involves interviews with key stakeholders, direct observation of blockchain technology implementation, and analysis of related documents, such as financial reports and financial management policies.

Research subject
The main research subjects in this research are educational institutions that have adopted or are currently adopting blockchain technology in their financial management (Lucian Ogrutan, 2020). This subject can cover various types of educational institutions, from elementary schools to universities, both at local, regional and national levels. In addition, research subjects also include stakeholders involved in the implementation and use of blockchain technology, such as school administrators, financial staff, education supervisors, and possibly also external parties such as blockchain technology vendors.

Research Ethics
In carrying out this research, it is very important to uphold research ethics to ensure compliance with moral principles and professionalism in collecting and using data. Several relevant research ethical principles to consider in this research are: 1. Obtain permission from the educational institution to be researched before starting the
research. This includes obtaining approval from the competent authorities at the institution as well as providing adequate information to all parties involved about the objectives, procedures and benefits of the research. 2. Ensure the confidentiality and privacy of data collected in research, both personal information from respondents and sensitive financial data from educational institutions. Data must be processed and stored in a way that maintains its security and confidentiality. 3. that research provides maximum benefits for all parties involved, including educational institutions, stakeholders and society in general. In addition, it is important to pay attention to fairness in accessing research results and ensure that the results can be used to improve education financial management policies and practices more broadly. 4. Maintain integrity in carrying out research and ensure that data analysis and interpretation is carried out objectively without any bias or influence from other parties (Jha, 2023). This includes transparency in reporting research results and avoiding conflicts of interest.

Data Collection Techniques or Data Processing Methods

Data collection techniques used include interviews, observation and document analysis. Interviews were conducted using a structured interview guide to gain an in-depth understanding of stakeholders’ experiences and views regarding the implementation of blockchain technology. Direct observations were carried out to practically understand how blockchain technology is implemented in the educational financial management process. In addition, analyze related documents, such as financial reports and financial management policies, to gain further understanding of the context and practices of financial management (Kozhasheva et al., 2022). The data collected was analyzed thematically and comparatively. Thematic analysis was used to identify patterns, trends, and themes that emerged from interviews and observations. Meanwhile, comparative analysis is used to compare and contrast financial management practices between educational institutions that use blockchain technology and those that do not.

RESULT AND DISCUSSION

Blockchain technology is a decentralized system used to record transactions and data encrypted in blocks that are connected and immutable. In a blockchain, each transaction or data record is stored in a block that is linked to the previous block via a cryptographic key, forming a block chain that cannot be manipulated or changed. In other words, blockchain is a database distributed across various nodes or computers connected in a network, where each data entry has a link to the previous entry, creating an immutable authentication proof of the history of that transaction or data (Sudha Sadasiuvam, 2021). The integration of blockchain technology in educational financial management promises major changes in the way educational institutions manage, track and report the use of educational funds. Blockchain technology, originally developed as the basis of digital currencies such as Bitcoin, is now known for its ability to create immutable proof of authentication for every transaction and
decentralized data record. In managing educational finances, this technology can provide solutions to the problems of transparency, accountability and efficiency that are often faced by educational institutions. Blockchain is essentially a distributed ledger that records transactions in interconnected, cryptographically validated blocks (Hussain & Cakir, 2020). The main uniqueness of this technology is that the data stored in the blockchain cannot be manipulated or changed without the consent of the majority of the network.

One of the most interesting aspects of blockchain technology is its transparency. Because every transaction is recorded on the blockchain and accessible to all parties involved, this process creates a high level of transparency (Liu & Zhu, 2021). For example, in the financial industry, blockchain enables real-time tracking of transactions, which can increase accountability and reduce the possibility of fraud. This also has the potential to reduce administrative costs associated with reconciliation and audit processes. In addition, security is the main pillar of blockchain technology (Rakhimberdiev et al., 2022). Compared to traditional systems that are vulnerable to hacker attacks and data manipulation, blockchain uses advanced cryptography to protect the integrity and confidentiality of information. Each block in the blockchain is encrypted with a unique code, and transactions can only be added to the blockchain after receiving validation from the majority of the network. This makes it very difficult for unauthorized parties to interfere with or change the data stored in the blockchain. Blockchain technology also offers the potential to change the business paradigm completely through the concept of decentralization (Al Shehhi & Almarri, 2022). Blockchain eliminates the need for intermediaries or third parties in the transaction process, such as banks or other financial institutions. This allows individuals or organizations to interact directly with each other without needing to trust a third party. An example is the use of blockchain in smart contracts, where agreements are automatically executed when predetermined conditions are met, without the need for human intervention or trust in third parties.

The integration of blockchain technology in educational financial management offers a number of benefits (Wang, 2022). One of the main benefits is increased transparency and accountability in the use of education funds. By using blockchain technology, every financial transaction can be recorded automatically and stored in a decentralized ledger that cannot be changed. This means that everyone, whether internal or external to educational institutions, can clearly track how education funds are used and ensure that their use is in accordance with the stated objectives. Apart from that, blockchain technology can also increase administrative efficiency in managing education finances. By using smart contracts, which are computer programs that are executed automatically based on predetermined regulations, administrative processes such as payment of teacher salaries, procurement of goods and services, and asset management can be carried out more quickly and efficiently. This can reduce administrative costs and increase the productivity of finance staff, so that more time and resources can be allocated to more important educational activities. In risk management, blockchain technology can also provide significant benefits (L. Chen, 2023). Because data is stored in an encrypted decentralized ledger, the risk of data manipulation or loss of information can be significantly reduced. Additionally, because every transaction is recorded
automatically and cannot be changed, educational institutions can easily verify the authenticity of transactions and trace the traces of each transaction.

Even though it has great potential, the implementation of blockchain technology in educational financial management is also faced with a number of challenges that need to be overcome. One of the main challenges is the limited technological infrastructure available in educational institutions. To use blockchain technology, educational institutions need to have adequate access to the internet network, computers and necessary software (Amin et al., 2020). This may be a challenge for educational institutions in areas that have limited technological infrastructure or limited access to financial resources. In addition, the integration of blockchain technology also requires sufficient technical knowledge to manage and maintain the related systems. Financial staff at educational institutions need to be trained and given a deep understanding of how blockchain technology works, how to manage transactions, and how to deal with problems that may arise. This may require additional investment in training and professional development for finance staff, which can be challenging for educational institutions with limited budgets. Another challenge is data security and privacy issues. Although blockchain technology is known for its security and reliability, security risks remain, mainly related to vulnerabilities in the implementation or software used (She & Lai, 2023). Additionally, because data stored in blockchain is public and indelible, data privacy issues can be a major concern, especially when it comes to sensitive information such as students' personal data or confidential financial information.

The use of blockchain technology in educational financial management can provide various innovations that support efficiency, transparency and security in managing financial resources that are important for educational institutions. Several ways to use blockchain technology in managing educational finances are: firstly, blockchain technology can be used to facilitate the payment of educational fees, both for local and international students. By using blockchain, every education fee payment transaction can be recorded permanently in an encrypted block chain. This not only increases transaction security, but also ensures that payments are made quickly and without third party intermediation, such as banks or other financial institutions. Payments recorded on the blockchain also enable real-time tracking of transactions, allowing educational institutions to manage their cash flow more efficiently. Both blockchain integrations can make scholarship fund management easier. By using smart contracts, educational institutions can set criteria and conditions for awarding scholarships automatically. For example, institutions may arrange scholarship payments to students who meet certain requirements, such as academic achievement or financial need. Smart contracts ensure that payments are made according to predetermined terms, without requiring human intervention (Management Association, 2021). This not only increases efficiency in distributing scholarship funds, but also reduces the risk of errors or misuse of funds.

Furthermore, educational institutions often rely on donations and external funding to support educational and research programs. Blockchain technology can be used to facilitate more efficient tracking and management of donation funds. Every donation transaction can be recorded in the blockchain, allowing donors to track the use of their funds transparently. Additionally, blockchain can also be used to reduce administrative costs associated with
distributing donation funds, ensuring that more resources can be allocated directly to support educational programs. Then blockchain can be used to verify academic credentials and certifications, such as transcripts and degrees. Using blockchain technology, each credential can be stored securely in a decentralized and encrypted block chain. This allows interested parties, including prospective students, employers, and other educational institutions, to verify the authenticity of credentials quickly and easily. Additionally, blockchain can also help reduce the risk of forgery or manipulation of academic credentials, increasing trust in the education system. Finally, blockchain can also be used for student identity management. Every student's identity can be recorded in the blockchain, including personal, academic and financial information (Universidad Técnica Particular de Loja et al., 2021). This allows educational institutions to manage student identity information more safely and efficiently. Additionally, blockchain can also be used to facilitate student registration and authentication processes, minimizing the risk of ideational fraud.

CONCLUSIONS

Based on the results and discussion above, it can be concluded that the integration of blockchain technology in educational financial management has great potential to increase transparency, accountability and efficiency in the education system. However, challenges related to infrastructure availability and technical understanding need to be overcome to optimize its benefits. Therefore, strategic and collaborative steps from related parties are needed to encourage widespread adoption of this technology in educational financial management. The integration of Blockchain Technology in Education Financial Management is a progressive step aimed at increasing transparency and accountability in the education system. By utilizing blockchain, educational institutions can optimize their financial management processes in a safer and more efficient way. One of the main benefits of using blockchain technology is its ability to record every transaction in detail in a distributed ledger that cannot be manipulated. This helps reduce the risk of fraud or errors in managing education funds, thereby increasing trust from all parties involved, including students, parents and the government.

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REFERENCES


Integration of Blockchain Technology in Education Financial Management


