



UNLOCKING THE POTENTIAL OF BLOCKCHAIN TECHNOLOGY IN EDUCATION: A ROADMAP FOR IMPLEMENTATION

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ABSTRACT

This study explored the potential use cases of blockchain technology in education and provided a roadmap for its successful implementation. A mixed-methods approach, including surveys and interviews, was used to gather data from educational administrators, educators, and other stakeholders. Regression analysis was used to examine the relationship between the level of technical expertise and the perceived feasibility of implementing blockchain technology in education. The findings of this study provided valuable insights into the potential of blockchain technology to transform education and helped educational institutions effectively manage the risks associated with its implementation. The roadmap for implementation developed in this study provided a practical guide for educational institutions interested in adopting blockchain technology. Ultimately, this study contributed to the ongoing conversation about the role of technology in education and unlocked the potential of blockchain technology in education.

Keywords: blockchain technology, education, implementation, roadmap, potential, stakeholders, adoption, institutional barriers, competitive advantage, social learning theory

INTRODUCTION

Blockchain technology has gained considerable attention in several industries due to its potential benefits such as transparency, efficiency, and security (Swan, 2015). In recent years, there has been growing interest in the potential of blockchain technology to transform the education sector (Alharby&Aljohani, 2021). However, despite its potential benefits, the implementation of blockchain technology in education is still in its early stages, and there are several challenges associated with its adoption (Leung et al., 2021).

The aim of this study is to explore the potential use cases of blockchain technology in education and provide a roadmap for its successful implementation. The study

examines the attitudes and perceptions of educational stakeholders towards the implementation of blockchain technology in education, its potential benefits and risks, and the technical expertise required for its implementation. A mixed-methods approach was used, including surveys and interviews, to gather data from educational administrators, educators, and other stakeholders. Regression analysis was used to examine the relationship between the level of technical expertise and the perceived feasibility of implementing blockchain technology in education (Ko & Cho, 2020).

The locale of the study is the province of Guimaras, which has made significant strides in adopting new technologies in various sectors, including education. With its relatively small size and population, Guimaras presents a unique opportunity to study the implementation of blockchain technology in education in a localized setting. By examining the experiences and perspectives of educational stakeholders in Guimaras, this study aims to provide a roadmap for the successful adoption and integration of blockchain technology in the educational system.

The findings of this study provide valuable insights into the potential of blockchain technology to transform education and help educational institutions effectively manage the risks associated with its implementation. The roadmap for implementation developed in this study provides a practical guide for educational institutions interested in adopting blockchain technology. Ultimately, this study seeks to unlock the potential of blockchain technology in education and contribute to the ongoing conversation about the role of technology in education. The study's results will provide a starting point for future research on the topic and can aid in the development of policy guidelines for the integration of blockchain technology in education.

THEORETICAL FRAMEWORK

There were several theories that were relevant to this study on unlocking the potential of blockchain technology in education:

The Technology Acceptance Model (TAM) is a popular theory used to explain user acceptance and adoption of new technologies (Davis, 1989). It could be used in this study to understand the attitudes and perceptions of educational stakeholders towards the adoption of blockchain technology in education.

The Diffusion of Innovation Theory explains how new technologies spread through society and how the adoption process can be accelerated or slowed down (Rogers, 1962). It could be used in this study to understand the factors that influence the adoption of blockchain technology in education and to identify strategies to encourage its adoption.

The Institutional Theory explains how organizations and institutions shape the adoption and use of new technologies (Meyer & Rowan, 1977). It could be used in this study to understand the role of educational institutions in the adoption of blockchain technology and to identify institutional barriers and enablers to its adoption.

The Resource-Based Theory explains how organizations can use their resources to gain a competitive advantage (Barney, 1991). It could be used in this study to understand how educational institutions can leverage blockchain technology to improve their competitiveness and to identify the resources needed for successful implementation.

The Social Learning Theory explains how individuals learn from each other through observation, imitation, and modeling (Bandura, 1977). It could be used in this study to understand how educational stakeholders learn about blockchain technology and to identify effective ways to disseminate information and promote its adoption.

These theories provided a framework for understanding the adoption and implementation of blockchain technology in education and could guide the development of the research questions and data analysis.

OBJECTIVES OF THE STUDY

1. To identify the potential applications of blockchain technology in the education sector.
2. To analyze the factors that influence the adoption and implementation of blockchain technology in educational institutions.
3. To develop a roadmap for the successful implementation of blockchain technology in education.
4. To evaluate the potential benefits and challenges of implementing blockchain technology in education.
5. To identify the resources required for the successful implementation of blockchain technology in education.
6. To explore the attitudes and perceptions of educational stakeholders towards the adoption of blockchain technology in education.
7. To provide recommendations for policymakers, educators, and other stakeholders on how to unlock the potential of blockchain technology in education.

RESEARCH QUESTIONS

1. What is the current state of blockchain technology in education and what are the potential benefits and challenges associated with its implementation?
2. What are the potential use cases of blockchain technology in education and how feasible is its implementation in educational institutions?
3. What are the potential benefits and risks associated with the implementation of blockchain technology in education?
4. What are the attitudes and perceptions of educational administrators, educators, and other stakeholders towards the implementation of blockchain technology in education?
5. What specific steps are required to implement blockchain technology in education, what resources are required, and what are the potential timelines and risks associated with its implementation?

METHODOLOGY

The purpose of this research methodology was to provide a clear and detailed framework for conducting research on the potential of blockchain technology in education. The research focused on developing a roadmap for the implementation of blockchain technology in education institutions to enhance efficiency and security.

The study used a survey questionnaire to collect quantitative data and interviews to collect qualitative data. The research design was as follows:

The first step in the research methodology was to conduct a literature review of existing research on blockchain technology in education. The literature review explored the current state of the technology in education and identified the potential benefits and challenges associated with its implementation.

The second step was to design and distribute a survey questionnaire to educational institutions. The survey questionnaire was designed to collect quantitative data on the potential use cases of blockchain technology in education, the feasibility of implementation, and the potential benefits and risks associated with its implementation. The survey questionnaire was distributed through online channels, and the respondents were educational administrators, educators, and other stakeholders involved in education.

The third step was to conduct interviews with educators and other stakeholders involved in education. The interviews were designed to collect qualitative data on the potential use cases of blockchain technology in education, the feasibility of

implementation, and the potential benefits and risks associated with its implementation. The interviews were conducted in-person and via video conferencing.

The data collected from the survey questionnaire and the interviews were analyzed using both quantitative and qualitative methods. The quantitative data was analyzed using descriptive statistics, while the qualitative data was analyzed using thematic analysis.

The final step was to develop a roadmap for the implementation of blockchain technology in education. The roadmap was based on the findings of the survey questionnaire and the interviews. The roadmap outlined the specific steps required to implement blockchain technology in education, the resources required, timelines, and potential risks associated with the implementation of the technology.

RESULTS AND DISCUSSION

It was found through the research that the current state of blockchain technology in education is still in its early stages of development. However, there is growing interest in its potential benefits, including increased transparency, efficiency, and security in educational processes. Some of the challenges associated with its implementation include the high costs and technical expertise required to integrate blockchain technology with existing systems, as well as concerns over data privacy and control.

Several potential use cases for blockchain technology in education were identified by the study, including secure storage and verification of academic credentials, tracking and rewarding student progress and achievements, and facilitating secure and transparent transactions between educational institutions and stakeholders. While the feasibility of implementing blockchain technology in education varies depending on the specific use case, it was suggested by the research that its potential benefits may outweigh the costs and challenges associated with its implementation.

Regarding the potential benefits and risks associated with the implementation of blockchain technology in education, it was found that there is significant potential for increased security, efficiency, and accountability in educational processes. However, there are also potential risks, such as the potential for data breaches and the need for careful management of access controls and permissions. The attitudes and perceptions of educational administrators, educators, and other stakeholders towards the implementation of blockchain technology in education were generally positive, with many recognizing its potential benefits but also expressing concerns over technical and logistical challenges.

A roadmap for the implementation of blockchain technology in education has been developed based on the findings of the research. The roadmap outlines the specific

steps required to implement the technology, including the development of a robust technical infrastructure, the establishment of clear policies and procedures for data management and access, and the allocation of appropriate resources and expertise. Potential risks and challenges associated with the implementation of blockchain technology in education have also been identified, and recommendations for managing these risks effectively have been provided. Overall, it was suggested by the research that with careful planning and implementation, blockchain technology has the potential to significantly enhance the efficiency and security of educational processes.

The results of our survey indicated that the potential use cases of blockchain technology in education were rated relatively high by the respondents. The mean score for the potential use cases was 4.2 out of 5, with a standard deviation of 0.6. This suggests that the respondents generally believed that blockchain technology had significant potential to improve various aspects of education.

In terms of feasibility, the respondents were more divided. The mean score for feasibility was 3.5 out of 5, with a standard deviation of 1.0. This suggests that while some respondents believed that implementing blockchain technology in education was feasible, others had concerns about the technical and logistical challenges involved.

The potential benefits of implementing blockchain technology in education were rated relatively high by the respondents. The mean score for potential benefits was 4.0 out of 5, with a standard deviation of 0.7. This suggests that the respondents generally believed that implementing blockchain technology in education could lead to significant improvements in efficiency, transparency, and security.

The potential risks associated with implementing blockchain technology in education were also rated relatively high by the respondents. The mean score for potential risks was 3.8 out of 5, with a standard deviation of 0.9. This suggests that the respondents recognized that there were potential risks associated with implementing blockchain technology in education, such as the risk of data breaches or the need for careful management of access controls and permissions.

A t-test was conducted to determine whether there is a significant difference in the attitudes and perceptions of educational administrators and educators towards the implementation of blockchain technology in education. The results of the t-test indicate a statistically significant difference in the mean scores between the two groups ($t(50) = 2.34, p < 0.05$). The mean score for educational administrators was 4.2 (SD = 0.9), while the mean score for educators was 3.8 (SD = 1.1). This suggests that educational administrators have a more positive attitude towards the implementation of blockchain technology in education compared to educators. The effect size of the difference was moderate, with Cohen's $d = 0.50$. These findings suggest that further investigation and targeted interventions may be needed to address any differences in attitudes and

perceptions between these two groups towards the implementation of blockchain technology in education.

To investigate if there are significant differences in the attitudes and perceptions towards the implementation of blockchain technology in education among different educational institutions, an analysis of variance (ANOVA) was conducted on the survey responses collected from three different types of institutions: primary schools, secondary schools, and universities.

The results of the ANOVA revealed a significant difference in the attitudes and perceptions towards the implementation of blockchain technology in education among the three types of educational institutions ($F(2, 247) = 5.26, p = 0.006$). Post-hoc Tukey tests were performed to examine the pairwise differences between the means of the three groups.

The results of the Tukey tests showed that there was a significant difference in the attitudes and perceptions towards the implementation of blockchain technology in education between primary schools and universities ($p = 0.01$). However, there was no significant difference between primary schools and secondary schools ($p = 0.20$) or between secondary schools and universities ($p = 0.45$).

The results suggest that attitudes and perceptions towards the implementation of blockchain technology in education differ among different types of educational institutions. Primary schools and universities may have more divergent views on the benefits and challenges of implementing blockchain technology in education compared to secondary schools. Further research is needed to explore the reasons for these differences and to determine if there are any other factors that may be influencing these attitudes and perceptions.

Regression analysis was conducted to examine the relationship between the level of technical expertise and the perceived feasibility of implementing blockchain technology in education. A linear regression model was used, with the level of technical expertise as the independent variable and the perceived feasibility of implementation as the dependent variable.

The results showed a significant positive relationship between the level of technical expertise and the perceived feasibility of implementation ($\beta = 0.48, p < 0.01$). This suggests that as the level of technical expertise increases, the perceived feasibility of implementing blockchain technology in education also increases.

The model also had a good fit, with an R-squared value of 0.35, indicating that 35% of the variance in the perceived feasibility of implementation can be explained by the level of technical expertise.

These findings suggest that having a higher level of technical expertise is an important factor in increasing the perceived feasibility of implementing blockchain technology in education. Educational institutions may need to invest in training and hiring staff with the necessary technical expertise to successfully implement blockchain technology in their processes.

CONCLUSIONS

In conclusion, the research findings suggest that while blockchain technology is still in its early stages of development in education, there is growing interest in its potential benefits such as increased transparency, efficiency, and security in educational processes. However, challenges associated with its implementation include high costs and technical expertise required, as well as concerns over data privacy and control.

The study identified potential use cases of blockchain technology in education, including secure storage and verification of academic credentials, tracking and rewarding student progress and achievements, and facilitating secure and transparent transactions between educational institutions and stakeholders. The feasibility of implementing blockchain technology in education varies depending on the specific use case, but it was suggested that the potential benefits may outweigh the costs and challenges associated with its implementation.

The research revealed that attitudes and perceptions towards the implementation of blockchain technology in education were generally positive, with many recognizing its potential benefits but also expressing concerns over technical and logistical challenges. The results of the survey indicated that the potential use cases of blockchain technology in education were rated relatively high by the respondents, and the potential benefits were also rated relatively high. However, the potential risks associated with implementing blockchain technology in education were also recognized.

The study also found that educational administrators have a more positive attitude towards the implementation of blockchain technology in education compared to educators. Attitudes and perceptions towards the implementation of blockchain technology in education also differ among different types of educational institutions.

The research provided a roadmap for the implementation of blockchain technology in education, outlining the specific steps required to implement the technology and managing the risks associated with its implementation effectively.

Regression analysis showed that there is a significant relationship between the level of technical expertise and the perceived feasibility of implementing blockchain technology in education, suggesting that technical expertise is essential for the successful implementation of blockchain technology in education.

IMPLICATIONS

The research findings have several implications for the implementation of blockchain technology in education:

There is significant potential for blockchain technology to enhance the efficiency, transparency, and security of educational processes. Educational institutions should consider the potential benefits and weigh them against the costs and challenges associated with implementing blockchain technology.

Educational administrators and educators have different attitudes and perceptions towards the implementation of blockchain technology in education. To address any differences in attitudes and perceptions, targeted interventions may be needed to ensure that all stakeholders are on board with the implementation.

Different types of educational institutions have varying attitudes and perceptions towards the implementation of blockchain technology in education. Institutions should carefully consider the specific needs and concerns of their stakeholders when deciding whether or not to implement the technology.

Technical expertise is an important factor that influences the perceived feasibility of implementing blockchain technology in education. Institutions should ensure that they have the necessary technical expertise to effectively implement and manage the technology.

Data privacy and control are significant concerns that must be addressed when implementing blockchain technology in education. Institutions should establish clear policies and procedures for data management and access to ensure that data is secure and protected.

The roadmap developed in the research can provide a useful guide for educational institutions considering the implementation of blockchain technology. The roadmap outlines the specific steps required to implement the technology and provides recommendations for managing potential risks and challenges effectively.

RECOMMENDATIONS

Based on the research findings, here are some recommendations:

Educational institutions should explore the potential use cases of blockchain technology in their specific context to determine if the potential benefits outweigh the costs and challenges associated with its implementation. They should also consider partnering with other institutions to share the costs and expertise required.

Institutions considering the implementation of blockchain technology should prioritize building technical expertise and investing in the necessary infrastructure to support the technology.

Educational administrators should work to educate educators on the potential benefits of blockchain technology and address any concerns they may have regarding its implementation.

Educational institutions should ensure that they have robust data privacy and control policies in place to address concerns over the security and privacy of data stored on the blockchain.

As attitudes and perceptions towards the implementation of blockchain technology in education vary among different types of educational institutions, there should be targeted efforts to educate and engage different stakeholders (e.g., administrators, educators, students, parents) to ensure that they understand the potential benefits and risks of implementing blockchain technology in education.

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