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Education Transformation in Namibia: A Student-Centric Blockchain Model

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Abstract: The study's objective was to propose a blockchain model in Namibian education systems to create a student-centric digital transformation paradigm. The study used existing materials relevant to block chain technology as part of the study data collection and data analysis. Blockchain has revolutionized the way universities work all over the world, and it's no different in the education sector, where virtual classrooms are being used to replace traditional ones. Blockchain technology presents several challenges in the context of higher education. One significant issue is scalability, as current blockchain networks may struggle to handle the high volume of transactions generated by large student populations. Interoperability is another concern; differing blockchain systems used by various institutions can hinder effective data sharing. Additionally, the cost of implementing blockchain solutions can be prohibitive for some schools, requiring substantial investment in infrastructure and training. Regulatory and legal issues also pose challenges, particularly regarding data privacy and compliance with laws such as FERPA. Moreover, there may be resistance to change from educators and administrators who are accustomed to traditional systems, making it difficult to foster a culture of innovation. The shortage of professionals with the necessary technical expertise further complicates the adoption process. Lastly, building trust among stakeholders-students, faculty, and employers-regarding the reliability of blockchain credentials is crucial for its successful implementation. Addressing these challenges will be key to unlocking the potential of blockchain in higher education. By doing so, this would improve efficiency by reducing cost and improving accountability, which can revolutionaries the future learning, teaching industry to reduce cost and time, and as a result, students or learners would get a chance for employability. For the purpose of this study, the study proposes a student-centric model for digital education transformation in Namibian Universities. The study recommends the Namibian education sector to adopt an integrated Education Model for student-centric and to use technologies such as blockchain technology, which can provide security, authenticity, immutability, longevity, data, information decentralisation, no intermediary, reliability, and data integrity.

Keywords: Educational transformation, Student- centric, Blockchain model

1. Introduction

Blockchain technology holds significant potential for transforming higher education by enhancing transparency, security, and efficiency in various administrative processes (Nyangaresi & Abeka, n.d.). By providing a decentralized and immutable ledger, blockchain can streamline the verification of academic credentials, reducing fraud and simplifying the background-check process for employers. This technology also facilitates secure and efficient management of student records, allowing students or learners to maintain ownership of their data and easily share it with institutions or potential employers. Moreover, blockchain can enable innovative models of credentialing, such as micro-credentials and digital badges, which can support lifelong learning and skill development. Ultimately, the integration of blockchain in

higher education can lead to a more trustworthy, accessible, and personalized educational experience.

Blockchain technology has piqued the public's interest due to its multiple benefits, including security, faster transactions, lower costs, anonymity, and data integrity (Nyangaresi & Abeka, n.d.). The success of Bitcoin has resulted in the use of blockchain technology in a variety of fields, including the IoT, voting, medical treatment, financial market, storage and supply chain.

Smart contracts are associated with faster transactions since the terms of the transactions are embedded in computer code and are automatically fulfilled by the software upon acknowledgement of a specific input. Because it functions without a trusted third party, a shared ledger adds to cost reductions by eliminating intermediaries.

Blockchain is one of the most recent developments that is gaining attraction among numerous stakeholders in several industries, including the education sector (Mohammad & Vargas, 2022). This is primarily owing to its appealing characteristics, which include decentralisation, transparency, traceability, security, and dependability. Despite its benefits, blockchain still faces various hurdles, and its adoption rate remains low.

Blockchain is a decentralised, immutable database made up of a succession of "blocks" that hold data such as timings, amounts, transaction dates and/or participants (Mohammad & Vargas, 2022). When a user conducts a transaction with another user via a peer-to-peer network, a cryptographic identification mechanism is utilised to uniquely identify the participants. After then, the transaction is transmitted to the blockchain network storage pool and awaits verification. The next block will be created once the number of approved nodes reaches a certain threshold, which is referred to as attaining consensus. Once consensus is reached, a new "block" will be created, and each node will update its copy of the blockchain ledger. A consensus algorithm is employed to complete the consensus phase. This is known as mining. Common consensus procedures include Proof of Work (PoW) or Proof of Stake (PoS).

Blockchain technology has several appealing characteristics, immutability, including traceability, transparency and decentralization. Decentralisation refers to the fact that the technology does not necessitate the use of a centralised node to record, store, or update data on the blockchain; rather, data can be recorded, saved, and updated in a distributed manner. As a result, rather than centralised organisations, mathematical methods are employed to foster confidence among remote nodes. Blockchain is unchangeable because it is a distributed ledger maintained by thousands of nodes.

This is due to the fact that tampering can only be successful if 51% of the ledgers are updated via the network. Furthermore, blockchain is transparent since data recording is transparent to all network nodes, even when data is modified. Furthermore, blockchain transactions are ordered chronologically, and a block is linked to its two adjacent blocks using a hash function. Thus, each transaction can be monitored by reviewing block metadata.

Blockchain is an online decentralised and distributed ledger technology that allows for the safe, verifiable, and transparent storage and tracking of records (Bozkurt & Ucar, 2020). More importantly, it features an infrastructure that is Web 3.0 compliant, which offers tremendous possibilities for lifelong learning.

The education sector is undergoing technological revolution. Virtual classrooms are gradually replacing traditional classrooms (Iyer et al., 2020). The proposed model is student-focused, allowing students to customize their curriculum based on their interests and field of study, rather than adhering to the conventional model, with micro-credit credits added per unit.

The objective is to use Blockchain's characteristics and benefits to adopt this new Education model technology in order to increase efficiency by lowering costs and increasing responsibility.

The alteration to the Education Framework is likely to have a significant impact on the future of the L&T Industry, both in terms of cost and time savings, as well as in terms of the likelihood of Learners obtaining employment.

Collaborative learning is defined as an interchange of ideas that allows and increases interaction between two students (student-student) dealing with learning material on a network (Bjelobaba et al., 2022). When we imagine people who appear to be entirely focused on the screens and keyboards of their gadgets, we typically assume that they are using those learning devices on their own. Individual learning images supplemented by electronic tools, on the other hand, frequently do not portray the hidden reality. In reality, students or learners routinely utilise their laptops to engage with others, and they frequently interact with their peers.

Purpose

The purpose of the study was to propose a block chain model in education systems in Namibia for digital transformation student centric model.

In the current circumstances, the primary scope is the need for a new educational framework, which this paper will address, followed by an assessment of Blockchain's relevance in this field. The research will include a study of the benefits, characteristics, and issues associated with Blockchain and how they relate to the needs of the modern new educational model imagined, as the new educational model anticipates that there will be few references for it.

Objectives

The main objective of the study was to propose a block chain model in education systems in Namibia for digital transformation student centric model.

Research Questions

How can we adapt the current educational model for today's and future students?

b. How can the Blockchain's features, problems, and benefits be applied to the suggested Future New Education Model?

Research Objectives

a. Examine the current educational model in order to adopt a new educational model that meets the needs of students or learners.
b. To use/implement Blockchain Technology in the Namibian Education Sector.

2. Literature Review

The current education system does not meet the aspirations of students or learners. Most universities charge fees that are so high that students cannot afford them (Iyer et al., 2020). Second, except for a small percentage of the intake, even a university degree does not guarantee employment. The skills taught to students or Learners are insufficient for the industry, and most corporations must provide training to new hires. Most reputable magazines, including Forbes, Gartner, and education experts, have discussed the skills taught.

In most cases, the universities' quality is likewise doubtful (Liu et al., 2018). Quality problems exist in industrialised economies such as China, the United Kingdom, and the United States, among others. In most cases, the universities' quality is likewise doubtful (Liu et al., 2018). Quality problems exist in industrialised economies such as China, UK, and US, among others.

Block Chain

A block chain, on the other hand, is a public ledger that automatically records and verifies records. This is especially important in the education system, where transcripts and certifications need to be verified for the employment process. Most critical elements for educational institutions can be facilitated by blockchain. The main features of Blockchain identified as a. decentralization, b. immutability, c. security, d. smart contracts, e. payment registry and f. transparency. The above features listed are as reported from implementation in Health Care, Crypto Currency, Banking, Logistics and education to some extent (Viriyasitavat et al., 2019).

Except for a few limitations that can be changed to be usable, the Education Framework requires the majority of the benefits of Blockchain Technology. The Blockchain technology endorses verification without depending on third parties. Blockchain data can be added and not altered or deleted. Cryptography secures data ledgers and dependent on the adjacent completed block to finish the process. Most of the data can be appended to the block on trust verification as the consensus of all ledger participants will be recorded on the block since the transactions registered in chronological order are time stamped. Since the data kept in many decentralized ledgers, hence the threat of losing data avoided.

The data is transparent and visible to persons given the authority. The risk of duplicity entry or fraud avoided due to the consensus protocols. The Education Framework requires all these features and benefits. The records should be safe and secured at all times. An employer to verify the same can view certificates. The data is not lost or altered, and confidentiality maintained because an authorized person can view data.

Blockchain is a chain of digital data blocks (Panagiotidis, 2022). Cryptographic processes are used to create a data chain in which each block is irrevocably connected to the preceding block. Therefore, if an attempt is made to modify a block, any subsequent blocks in the chain must be altered in order to maintain chain validity; otherwise, any blocks after the alteration is made will be null and void (see Nofer et al., 2017).

Block Chain Technology

Blockchain is a type of software that makes it possible to securely transfer value (like money, stuff, contracts, or ID) over the internet without having to go through a middleman like banks or governments.

Blockchain, the cornerstone of Bitcoin, has recently gained a lot of attention (Zheng et al., 2017). Blockchain functions as an immutable ledger that enables decentralised transactions. Blockchain-based applications are emerging in a variety of industries, including financial services, reputation systems, and the Internet of Things (IoT), among others. However, many hurdles of blockchain technology remain to be overcome, including as scalability and security issues (Lakkis & Issa, 2022).

Typically, blockchain technology is associated with cryptocurrencies such as Bitcoin. It is a distributed database of transaction records that is checked and maintained by a global network of computers. Instead of one big government, like a bank, all the records belong to a big group of people, and no one person can control them. Plus, you can't go back and change or delete any transaction history.

In contrast to a traditional centralised database, the information in blockchain cannot be changed due to its distributed structure and peer-confirmed assurances. In other words, when a standard centralised database is housed on a single server, blockchain is distributed across

software users. Because blockchain allows anybody on the network to view everyone else's entries, it is difficult for a single central entity to seize control of the network.

When a transaction is made, it is transmitted to the network, where computer algorithms confirm its validity. A transaction chain is created by connecting the validated transaction to the previous one. This chain is known as the blockchain.

3. Research Methodology

The practical "how" of any given piece of research is simply referred to as research technique. More precisely, it is concerned with how a researcher designs a study in a systematic manner to produce accurate and trustworthy results that address the research aims and objectives.

Literature Search and Inclusion Criteria

Several important criteria should be set up to guarantee an in-depth evaluation. The study in consideration carried out a literature review in which PRIMA was utilized to evaluate the goal, relevance, importance, method, and applicability) model. In order to effectively synthesize existing information and identify gaps in the research landscape, the study has employed a systematic set of criteria through the literature review.

Research Design

Studies that meet the following criteria were included in the systematic review: a. Published peer-reviewed articles, dissertations, and conference papers between the period of 2010-2023. b. Studies conducted in the context of higher education institutions in Namibia and globally.

Research Approach

The study made use of pre-existing materials relating to the study under consideration as part of data gathering and data analysis. Secondary data is research data that has already been collected and is available to researchers (Apuke,2017). Primary data, on the other hand, is data acquired directly from its source.

Population

A population is any specified group of human beings or non-human items such as objects, educational institutions, time units, geographical areas, wheat prices, or individual salaries (Wani, 2017). Some statisticians refer to it as the universe. A class is a population with a limited number of individuals, members, or units. An endless population is one that has an infinite number of people. An example of infinite population is the population of pressures at various points in the atmosphere.

The population of actual persons is referred to as the existent population, whereas the hypothetical population is the collection of all possible ways in which an event can occur. Thematic analyses were utilised in this study to assess materials acquired from existing scholars relevant to blockchain in education. The population is adequately defined, so there is no doubt about whether a given unit is part of the population.

For example, in a survey of mathematics achievement, a researcher must define the population of students by age or grade and, if appropriate, the type of schools, geographical area, and academic year for which the data will be gathered.

Sample Size

The act of deciding how many observations or repetitions to include in a statistical study is known as sample size determination. The mathematical estimation of the number of subjects/units to be included in a study is known as sample size determination (Kaur, 2017). Determining sample size in descriptive studies differs from that in experimental investigations. Determining the size of a sample helps to enhance the quality of peer-reviewed research. is a Creative Commons Attribution License (CCP) licensed open access article that may be distributed and reproduced in any medium provided that the original work is correctly cited.

Data Analysis

The study used longitudinal analysis to analysis secondary data. Secondary data analysis allows for longitudinal study, which is uncommon in social research due to the time and cost necessary (Bryman:2004). Menard (1991) defines longitudinal research as the collecting and analysis of data throughout time. Secondary data analysis allows researchers to do longitudinal analysis, which is critical in social science research since it allows researchers to assess social change. According to Procter (1996), researchers can utilise secondary data analysis to characterise patterns of change and identify the sources of change. Others say that, while longitudinal studies are expensive and time intensive, their usage helps to ensure a holistic approach to empirical research (Oyen:1990). Secondary data analysis is the sole technique that can be utilised to acquire data in various types of research (Nachmias & Nachmias:1992). Historians, for example, rely more on secondary data than primary data since, in order to comprehend what happened during WWII, they must look for evidence in archives, books, and journals. Finally, the thesis is that secondary data analysis is an integral aspect of social science research.

Validity, Trustworthiness, and Reliability

Validity is defined as the degree to which an idea is accurately measured in a quantitative investigation (Taherdoost, 2018). The study relied on descriptive validity since it is reliable for giving details on events, aims, behaviours, individuals, settings, circumstances, and locations. The study ensured the authenticity and validity of the information provided by respondents. Both respondents and the survey will maintain their privacy. A pilot study will be carried out to verify the research questions. To ensure the validity of the data analysis for this project, the data collection instruments will be triangulated (Stahl).

Research Ethics

Research ethics can be defined as conducting research in a way that is both morally and legally sound. In actuality, they are conduct norms that distinguish between acceptable and undesirable behaviors as well as between good and bad. When done properly, research is a public trust. Researchers must therefore thoroughly understand the theories and protocols put in place to guarantee ethical research practices (Parveen & Showkat, 2017). The researcher must have a clear understanding of what ethical research is. Based on existing knowledge, researchers should design a procedure that protects study participants' safety and security while adhering to fundamental ethical standards.

Significance

Data security and the ability to secure data even if a specific node is compromised are two advantages of using blockchain in education. Blockchain technology has the potential to completely alter this business. Aside from facilitating lifelong learning, blockchain technology can enable global access to open educational resources such as public domain books, podcasts,

and videos that are free to use and redistribute. Blockchain allows these resources to be shared on a public network in an economical and secure manner. In this scenario, Namibians are embracing block chain technology.

4. Data Analysis and Interpretation Foundations of Knowledge

The first study depicted an integrated Education Model that proposes to be student-centric and to use technologies such as blockchain technology, which can provide security, authenticity, immutability, longevity, data, information decentralisation, no intermediary, reliability, and data integrity.

Education Blockchain 4.0 is a component of the Fourth Industrial Revolution that is changing the educational landscape. Blockchain technology has gotten a lot of interest from users, researchers, and practitioners during the last decade. Despite the rising interest in Blockchain technology, there has been limited progress in terms of educational applications. This system utilises blockchain-based educational application research. The Internet of Things and artificial intelligence are speeding up the world. Education Blockchain 4.0 is a logical extension of Industry Revolution 4.0, which is quickly becoming an unavoidable norm and requirement in globalisation.

It is essential in the educational system as a result of technological disruption. PLS-SEM, which statistically can validate these connections, was used to confirm the conceptual model that proves the relationship between various constructs. Smart Blockchain Systems in Education will digitise everything, making it easily storable, immutable, safe, long-lasting, accessible, cost-effective, user-friendly, and integrable with other technologies. The proposed Education Blockchain 4.0 smart system is positioned to accomplish these objectives across domains and to incorporate new technologies, making it the best solution for various applications, which is the primary contribution of the study. Furthermore, the integration of the new student-centric education ecosystem's system theory, the disruption theory for Blockchain technology in education, and the stakeholder theory.

Education Blockchain 4.0 will help educational organisations save money and reach scale by merging numerous capabilities and sectors. It will be useful in making policy decisions that will increase revenue, profitability, and stakeholder satisfaction.

Foundations of Knowledge
The education sector is undergoing technological revolution. Traditional classes are being replaced by virtual classrooms. Rather than following the traditional paradigm, the proposed approach is student-centric, with the student having the choice to construct his curriculum depending on his interests and area of work, with credits from micro-credentials added per unit. The goal was to deliver this new Education model technology to boost efficiency by cutting costs and increasing responsibility by leveraging Blockchain's characteristics and benefits. The Educational Framework revolution has the potential to revolutionize the Learning and Teaching Industry in the years to come by reducing costs and time, as well as improving Learners' employment prospects. This research report proposes to validate this research through the use of the Modified AdkAR Change Management Model.

Foundations of Knowledge
Blockchain is a web-based, decentralized, and distributed ledger technology that enables secure, auditable, and open records to be securely stored and monitored. Furthermore, it is built on a web-scale, Web-3.0-compliant infrastructure, providing unprecedented opportunities for lifelong learning. Based on their research, they suggest that blockchain technology could be used to link and link different learning experiences that happen in different types of

education, so we can look at learning in a whole new light and use new tech to help people learn for the rest of their lives.

Foundations of Knowledge
New technical breakthroughs, including as 5G networks, smart and networked devices, and the growth of the Internet of Things (IoT), usher in a new reality in which the secure transfer of data is unavoidable. In this new world, blockchain technology can play a critical role by providing the required backdrop for the safe and secure operation of systems. Blockchain is a distributed ledger that stores and verifies information and data. These data blocks do not have to be related to financial transactions, but they might be about anything else that needs to be securely stored and not changed retrospectively. Although digital currency (Bitcoin) was the initial application of blockchain technology, its utility is not limited.

Blockchain, particularly in its final version v3.0, has many uses in diverse areas such as data storage, product and service certification, government, insurance, health, science, and education. The paper focused on blockchain's existing and potential educational applications, as well as how this technology might be utilised to tackle specific educational difficulties. Some HEI and institutions are now implementing blockchain applications for the issuance and storage of certificates and diplomas, the evaluation of learning outcomes, the support and management of academic degrees, intellectual property protection, student-professor collaboration, learning accreditation, payment for studies, the formation of an academic passport (portfolio), or the administration of the educational process. The study examines the benefits and features of blockchain.

5. Conclusion and Recommendations

- The result recommends that the Namibian education sector adopt an integrated Education Model that emphasises student-centeredness and the use of technologies such as blockchain technology, which can provide security, authenticity, immutability, longevity, data, information decentralisation, no intermediary, reliability, and data integrity.

The study recommends the Namibia institutions focused on blockchain's existing and potential educational applications, as well as how this technology might be utilised to tackle specific educational difficulties. Some higher education institutions and universities are now using blockchain for a variety of purposes, like issuing and storing diplomas and certificates, paying for studies, helping students work together with their professors, accreditation, learning outcomes, managing academic degrees, protecting intellectual property, creating an academic passport, or running the educational system.

- According to the report, transforming the Education Framework has the ability to change the future Learning and Teaching Industry in Namibia by decreasing costs and time.
- This study suggests that blockchain technology could be used to link up different learning experiences that happen in different types of education, so we can look at education from all angles and use it to help people learn for life in Namibia using the latest tech.
- The study recommends blockchain's existing and potential educational applications, as well as how this technology might be utilised to tackle specific educational difficulties in Namibia.

6. Conclusion

Blockchain technology is decentralised and dispersed in theory, which means that no single authority controls it. In practice, there's no one solid foundation to build on. It's spread out, and since there's no single failure point, it's long-lasting and resilient. But the fact that it's a network, with nodes and connections, means it works like a computer. In the future, it could

be seen as the missing piece in the puzzle of the idea that the internet and web are like the brains of the world, but with more advanced and better features than what came before.

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