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TOPIC:" RISING OF BLOCKCHAIN IN EDUCATION"

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Abstract:

Blockchain is the decentralized system that store record of all transactions done by different nodes of network. So, it is used in many fields for record keeping. The blockchain technology is used in the arena of education for record keeping and digital certification. There have been published many credentials on the use of blockchain in education but we cannot find a single paper which cover all the educational projects related to blockchain. So, there is a breach of up-to-date educational trends. Today, Use of blockchain in education firmness many matters of teachers and students. On that origin, we deduce that there is a necessity to conduct the review. Main focus of this paper is to discuss the blockchain based educational projects. In this review paper we 'll also discuss the features of blockchain which are used to improve the blockchain centered educational projects.

Keywords: Blockchain, Educational projects, Record Keeping, Digital Certification, Education,

INTRODUCTION:

Now a days, Record keeping and digital certification is a big issue faced by all the educational institutions. In a worldwide education market many educational institution are involved so it is very difficult to keep the record of different procedures. [1]

In today's period, blockchain point out the prime and hot issues related to education and also gives satisfactory solutions to them. The certificate is considered to be sketch of ability of a person. In past, the certificate was used to represent the grades on paper. Now, the previous trend is changed into digital certificates[2]. While preparing the manual paper certificate it took lot of time but digital certificates minimize the processes of management[3]. So, the blockchain technology is used as an encouraging solution for record keeping and digital certification. Blockchain technology also minimize the degree of fraud and recover the system while calculating the salaries of staff and student's scholarships[4].

for the purpose of improving Many educational projects have been launched for the benefit of users in today's educational system, however we must note that these projects are not presented in a single article. As a result, there is a significant disparity between present educational trends. This research demonstrates the disconnect between blockchain in education and its most recent trend and uses.[5]

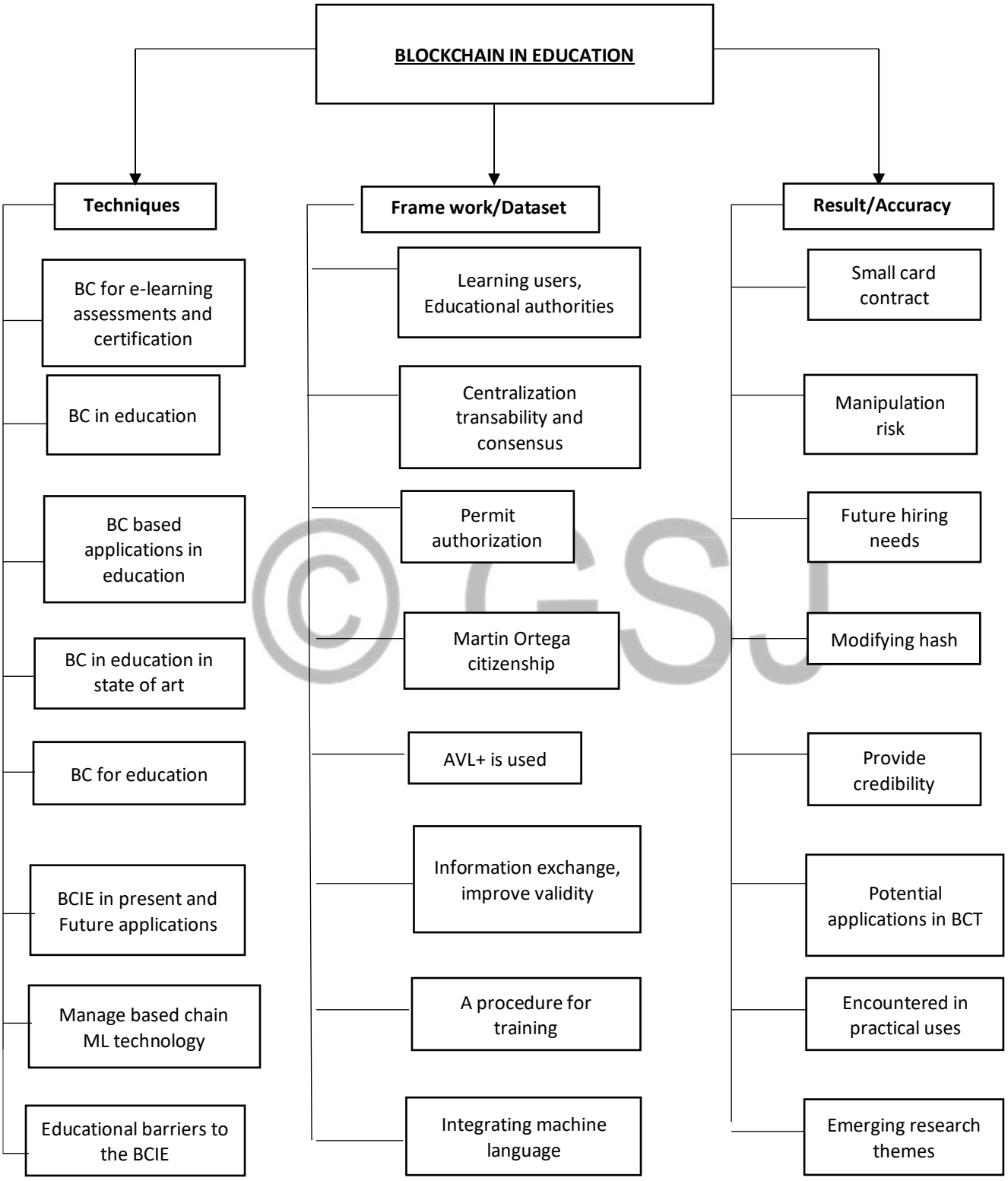
Many blockchain capabilities are being employed to build blockchain-based educational applications, according to the study. We also go through various blockchain-based educational

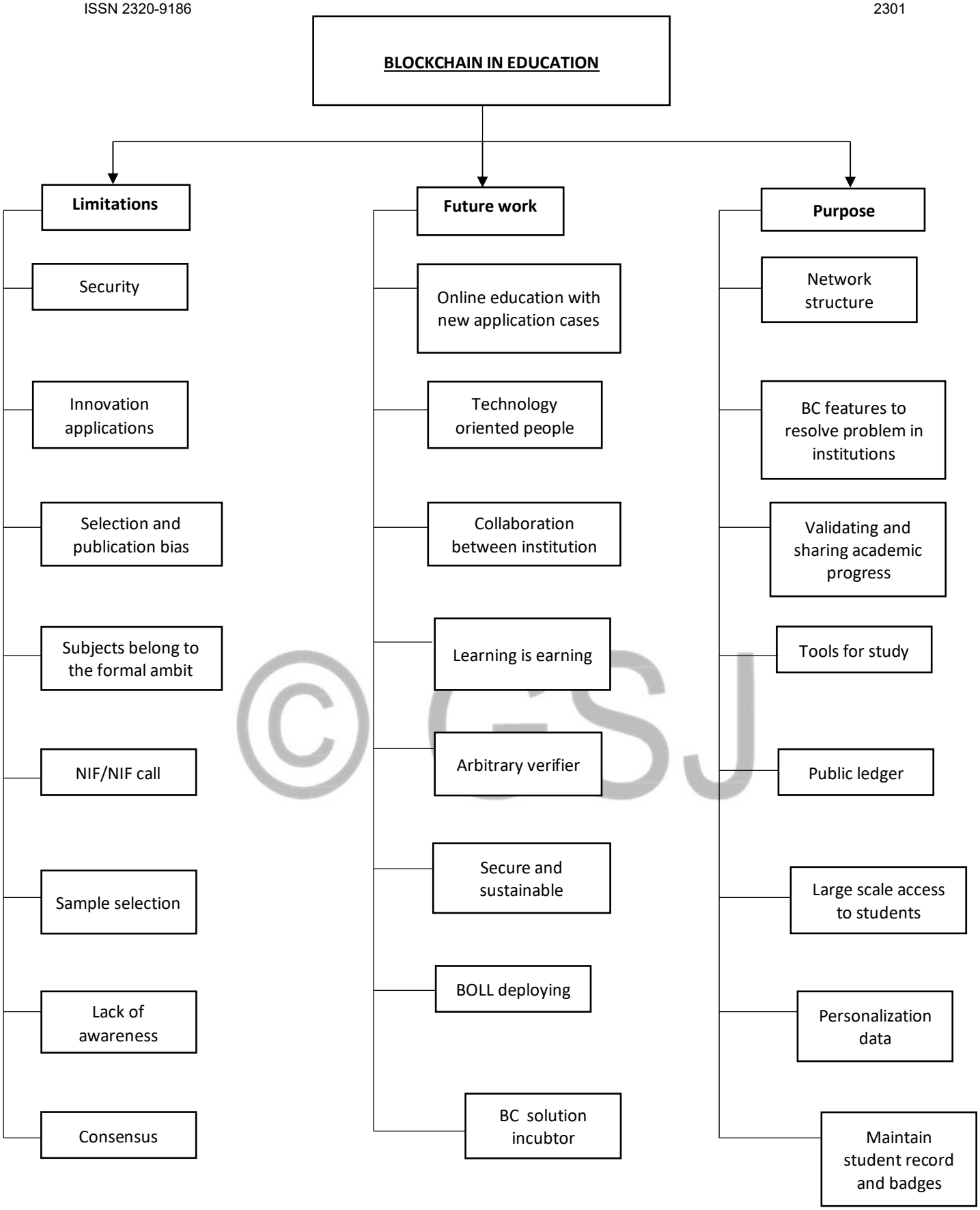
models like Edge coin, Blocker, and Tutela's in this review. However, there are still certain concerns, such as scalability.[6]

Contrast:

We take most our data from the paper **Blockchain-based Education Project.**In our paper we developed a regionalized Firmness smart contract for shifting credits to students through a BC holder which differs from the paper **Blockchain-based Education Project**. In this, the credits are rehabilitated into demonstrations and are relocated. The safekeeping is providing using civic crucial encoding and hashing methods. The educational institutions and students enumerated on the BC are providing with a private key. When a scholar completes a recorded progression, the recognition is rehabilitated into a nominal and protected in the BC holder. To certify the refuge of the projected system, the influence of countless outbreaks on the system has been investigated and the system was found to be unaffected to those outbreaks. The scalability of the system is established by shipment challenging by enhancing the number of educational sectors record-keeping on the BC stage and examining the determined answer period besides minutest rejoinder period.

Taxonomy:




BLOCKCHAIN IN EDUCATION
Limitations
Security
Innovation applications
Selection and publication bias
Subjects belong to the formal ambit
NIF/NIF call
Sample selection
Lack of awareness
Consensus
Future work
Online education with new application cases
Technology oriented people
Collaboration between institution
Learning is earning
Arbitrary verifier
Secure and sustainable
BOLL deploying
BC solution incubtor
Purpose
Network structure
BC features to resolve problem in institutions
Validating and sharing academic progress
Tools for study
Public ledger
Large scale access to students
Personalization data
Maintain student record and badges

CLASSIFICATION:

Rising of blockchain in education is further classified into following sections.

1. Techniques

While adopting Blockchain in education some techniques were used;

1.1 BC for e-learning assessments and certification:

There is no doubting the significance of education in a rustic's development and advancement. As a result, finding novel technology like blockchain to assist in the education industry has always been a difficulty. The most visible advantages can be found in the manner in which knowledge storage is managed. Other advantages can be found in information security, system trust, multinational ubiquitous data, formative analysis, and a few have made money by utilizing good contracts. [1,3]

Certification, in its broadest sense, refers to any method of issuing a certificate as proof of a claim. Certification is used in education in a variety of ways, including as proof of:

- A learner's approach of learning, regardless of the form of learning;
- Achievement of learning objectives, regardless of learning style;
- A teacher's ability to teach;
- An associate degree certification body that is licensed to grant certifications;
- An academic organization or course that meets set quality criteria. [2,5]

1.2 BC in Education:

Various projects have been attempted by educational institutions to use blockchain technology to keep the information of their students and colleges. The University of Nicosia deployed blockchain technology for the first time to maintain the records of scholars, such as credentials received from MOOC sites. The Massachusetts Institute of Technology (MIT) has created an erudition machine that is enabled by blockchain technology, as well as a notecase for his or her students that contains the student's instructional records. Holbert on University is also utilizing blockchain technology to save students' academic records, such as their credentials, studying habits, and activities at school. BC based applications in education: [3,4]

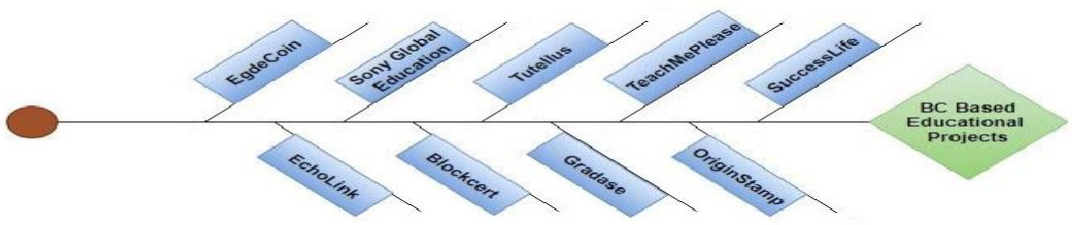


Fig. 1. BC based Educational Projects

1.3 Applications of blockchain in education:

Blockchain is a technology that has uses on international and national levels. It is used at all levels in the field of education such as school, colleges, universities, studentship etc.
Here we discuss some blockchain built educational schemes used across the world.[5]

- **Edge coin:**

Edge coin is a system for educational institution than can give an opportunity to individuals to handle their all payments related to education such as fees, book payment, accommodation etc. through a decentralized application. Edge coin can also store all academic documents such as degrees. Edge coin totally change the educational trade. So there are less chances of fraud, Damage and losses[9].

- **Sony Global Education**

Sony global education is a new informative policy that introduced after the association of IBM in which blockchain is used to save and section the top score of a student. First time in 2017, Sony global education and Sony cooperation declare we would make a system in which we can easily use the blockchain technology in education system[10].

- **TUTELLUS:**

It is a new blockchain policy which is used to sole current education cost of higher secondary level students. In 2016, online education had USD 165 billion value which is inadequate to broad the educational essential in all over the world [14]. Many educated people and graduates remain unemployed and number of new jobs and vacancies are decreasing. Almost all the educated people can use the internet on mobile so they can join this useful stage because it is easily inexpensive[10].

- **Teach Me Please**

Teach Me Please is a new trending project based on blockchain. The main purpose of this project is to motivate the people to get lifelong education. One more important purpose of this project is to change the method to store and accessed all educational records[15].

- **Blocker**

It is an open source blockchain application which is used to handle student's record. Wallet app is cast-off to safely store pupil's data, core determination of this application is to securely matter e-certificates by spending bitcoin blockchain technology[19].

- **Grad Base**

This system is also based on bitcoin blockchain technology. It is used to verify educational record. This system also used to add QR code to student CVs. It supports LinkedIn system. Students can easily log in to browser to update or make any changes to data.[13,19].

- **Echo-Link**:

It is also a blockchain based system that is used to establish relationship between different entities such as teacher and student. It stores all data of students which is verified, in unchangeable format ion permission less blockchain. All data get from trusted recourse. [14]

- **Origin stamp**

Origin-stamp is a web-based time-stamping system that is used to store time proof time stamps of any digital content by using decentralized bitcoin blockchain system. It can also use to store fingerprints of clients permanently for future use.[16]

TABLE 1. BC Based projects and Used Technology

Sr. No.	Projects	Technology
1	Edge Coin	Proof of scale
2	Teach Me Please	Dopes
3	Success Life	BOLT
4	Sony Global Education	Hyperledger Fabric
5	Tutela's	Shading
6	Echo-Link	Pos
7	Origin-Stamp	POW
8	Grad-Base	POW
9	Block-Certs	POW

TABLE 2. Features Used By these Projects

Features	Edge coin	Tutela's	SGE	TMP	Success life	Echo link	Blocker	Grad-Base	Origin Stamp
Decentralize	✓	✓	✓	✓	✓	✓	✓	✓	✓
Immutability	✓	✓		✓	✓	✓	✓	✓	✓

Traceability	✓	✓	✓	✓	✓	✓	✓	✓	
Currency	✓	✓			✓				
Open source	✓	✓	✓		✓		✓		
Anonymity			✓						
Censorship Resistance	✓	✓		✓	✓	✓	✓	✓	✓
Transaction Rate	✓	✓	✓	✓	✓	✓	✓	✓	✓

1.4 BC education in state of art:

Blockchain is the rapidly-spreading domain, with a strong analysis cost over the previous limited years. However, when observing for state-of-the-art, we tend to come across only two studies that discuss analysis patterns. To begin, we have a propensity to locate a study published by the European Directive, and we are aware that it is primarily focused on the corporal and digital aspects.[17]

1.5 BC for education:

When looking at how blockchain is being used in education, the most important thing to remember is that it is being used in a timely and up-to-date manner. While there are various applications to sets, proof of education, and so on, the certification of the CV is the starting point. It's probable that eons will pass before a suitable application in learning occurs.[18]

1.6 BC in present and Future applications:

A number of things that were originally hypothesized within the model were eliminated using structural equation modelling to arrive at the final adjusted model. The developed model will be useful for educational institutions who are implementing or considering introducing e-

learning. It provides information on the areas where blockchain technology will be used to benefit e-learning systems, as well as the most important solutions available in these fields. The implementation of blockchain technology in expanding and modelling numerous e-learning models that were carefully examined during this study is a future addition to this domain.[19]

1.7 Educational barriers to the BCIE:

For practitioners in this domain, the study helps to provide a greater understanding of associated impediments and viable solutions. Following that, the identification of adoption barriers will alter a critical data basis and recommend potential solutions for successfully using blockchain technologies in the AEC industry.[20]

2. Purposes:

Currently, there are many purposes to using BCT in education organizations. We look at the diverse bids of BC in education.

2.1. Network structure:

Every single BC entail of a band of a protuberance operational on a peer- to
-peer (P2P). Each protuberance in a network has a facsimile of the public record which becomes efficient appropriate. Each protuberance can validate communications, pledge or receive contract and create chunks. [21]

2.2. BC features to resolve problem in institutions

Blockchain disregards double-dealing and scam. There's no chamber for supplying false steps. All student will have a sole ID number by means of NFT standards. For example, when a student receipts a trial or succumbs a project, the teacher will contribution the final design on a tamper-proof greatest. The top of every single student is sequestered and personal. The student is the individual person who can approve separate articles to interpretation it. [22,31]

Society from everywhere the world will have alike entree to the identical progression supplies. There are no problematic necessities or long submission procedure. Students will have the chance to frequency and appraisal every single sequence that they've occupied. The teacher and development creator will effort stiff in generating first-class gratified and erudition skills. With blockchain technology, students will acquire themes that they're actually concerned in.

Distinct the up-to-date period, society go to schools just to get a well job. Through blockchain, the student elects the passage that welfares them the furthermost.

There are many Deed (decentralized education) ventures accurate nowadays. One of them is **Forward Protocol**. It's flagging the method for new learning and teaching involvement. Over BC and smart contract technologies, everyone will profit the furthermost from his/her education. [9,23]

2.3. Validating and sharing academic progress

The blockchain then receipts upkeep of marking, charitable teachers supplementary time for supplementary theoretical happenings, and the student's slash converts a fragment of their enduring hypothetical best ever, kept steadily on the Biti can correspondingly recover the eminence of online education by ornamental the authorization development. [16,24]

2.4. Tools for study

- **Remix**

  Remix IDE is a browser-based BC instrument rummage-sale for the formation and positioning of smart contracts

- **Meta mask**

  Meta mask is a folder intended to purpose those entertainments as a bond among Ethereum BC and a browser (Chrome or Firefox). Fundamentally, its performances as a browser postponement. Its proposals a software stage that agrees you to attend Ether and additional ERC-20 resources although likewise hire you cooperate with Ethereum Daps. The finest share – you can do so correct from your browser. [17,25]

- **Truffle**

  Truffle can make mechanical indenture challenging using Chai and Mocha. Truffle can also allow smart contract growth, counting connecting, gathering, and disposition. Desirable, it bids a configurable figure channel for accomplishment tradition shape dealings. [8,26]

- **Geth**

Geth is obtainable in the three edges, plus JSON-RPC server, command-line, and co-operating cabinet. It can be leveraged for BC extension on all three key of OS– Windows, Mac, and Linux. [14,27]

2.5. Large scale access to students &maintain student records

The BC can supply knowledge archives in a righthand, circulated way, deliver reliable numerical certificates, understand learning reserve allocation by smart contract, and guard academic stuff finished data encoding. The investigate displays that the incorporation of BC is a talented tendency in the growth of e- learning. [28,39]

2.6. Data personalization

BC let operators to switch their data through secluded and community keys, permitting them to individual it. Third-party mediators are not permissible to misappropriation and attain figures. If private information is deposited on the BC proprietors of such statistics can switch once and by what method a third-party can admittance it. [15,29]

3. Result/Accuracy:

By means of a BC, though, does not confirm data correctness of the go in data on-chain, by strategy. Yet, BC is precisely defended in contradiction of management of facts, which is absolute after it drives on the communal catalogue and provide accurate results. [1,30]

3.1. Small contract

Smart contracts are just agendas stowed on ABC that run when prearranged circumstances are happened. They stereotypically are second-hand to systematize the implementation of an arrangement so that all contestant's container be proximately positive of the consequence, without any arbitrator's participation or time loss. They can likewise mechanize a system, prompting the next achievement when circumstances are encountered. [12,31]

- Savings
- Security
- Trust and transparency
- Speed, accuracy and efficacy

3.2. Future hiring needs

BC is predictable to increase its possibility of serviceability into numerous supplementary zones, as well as the Internet of Things (IoT), wide-ranging data analysis, law-making / prosecution, and economics. BC will automatically alteration how we breathing and effort in the forthcoming. The Global BC Marketplace is probable to influence USD 34 billion by 2026, with a development amount of 45%. [27,32]

3.3. Encountered in practical uses

A teacher should plug-in instructions and developments into a BC, setting up errands for scholars, and the Blockchains smart contract would mechanically prove the achievement of each mission and then transport the student the subsequent chore until all mission are ample. [25.33]

3.4. Provide credibility

BCT recovers trustworthiness due to safety organizations in the institutions anywhere information can easily be operated but encoding the statistics with BC data that this data will not be nearby to unsanctioned persons. Thus, keeping student information such as designations, economic fesses talk etc. safe.

Manipulation risk

The existing building of BC is high on energy feasting and to have glitches with grading. This the origin tricky of the BC.[34]

4. Future work:

additional domains of education where blockchain technology could be employed in the future

4.1. Design/methodology/approach:

The bibliometric evaluation was performed to obtain data from books, journals, authors and quotes collected, and evaluated using bibliometric analysis. On the ProQuest website, data was gathered under the subject "Block Chain in Pedagogy." This systematic review of the literature was prompted by the following questions.[35]

- **Findings**

- The paper examines the advantages, drawbacks, and present application of blockchain eLearning. According to studies, cryptocurrency digital learning is still a relatively young concept, but it holds a ton of potential for the educational field overall.
- **Practical implications**

Although this study suggested probable other uses of blockchain technology in many education-based activities, additional applications can be developed. a blockchain tech education programmed. [5,36]

4.2: Online education with new application cases:

A blockchain is a chronological data block data structure. Fragmentation, reliability, data sharing, security, and other characteristics describe it. It's commonly used in industries including digital banking, blockchain based, and credit counseling. Online education, a revolutionary educational style, has grown in popularity as internet technology has advanced. Intellectual respectability, accreditation and licensing, student confidentiality, and intellectual sharing are all difficulties that this system of education still faces. This article explores the fundamentals of technology and the characteristics of block chain through a book study and case research, and suggests a blockchain-based solution to online education difficulties. Block chain can secure intellectual property by encrypting data and maintaining reliable, flexible study records. It can also give trustworthy digital certification, identify intelligent contract sharing resources, and maintain reliable, distributed learning records. According to research, using cryptocurrency technology to improve educational software is a potential trend. [5,37]

4.3. Technology oriented people:

Blockchain-based technology can be understood as a distributed, well-organized computer network, which is equally compatible with the same world while tolerating failure (including malicious behavior) to some degree. [6,38]

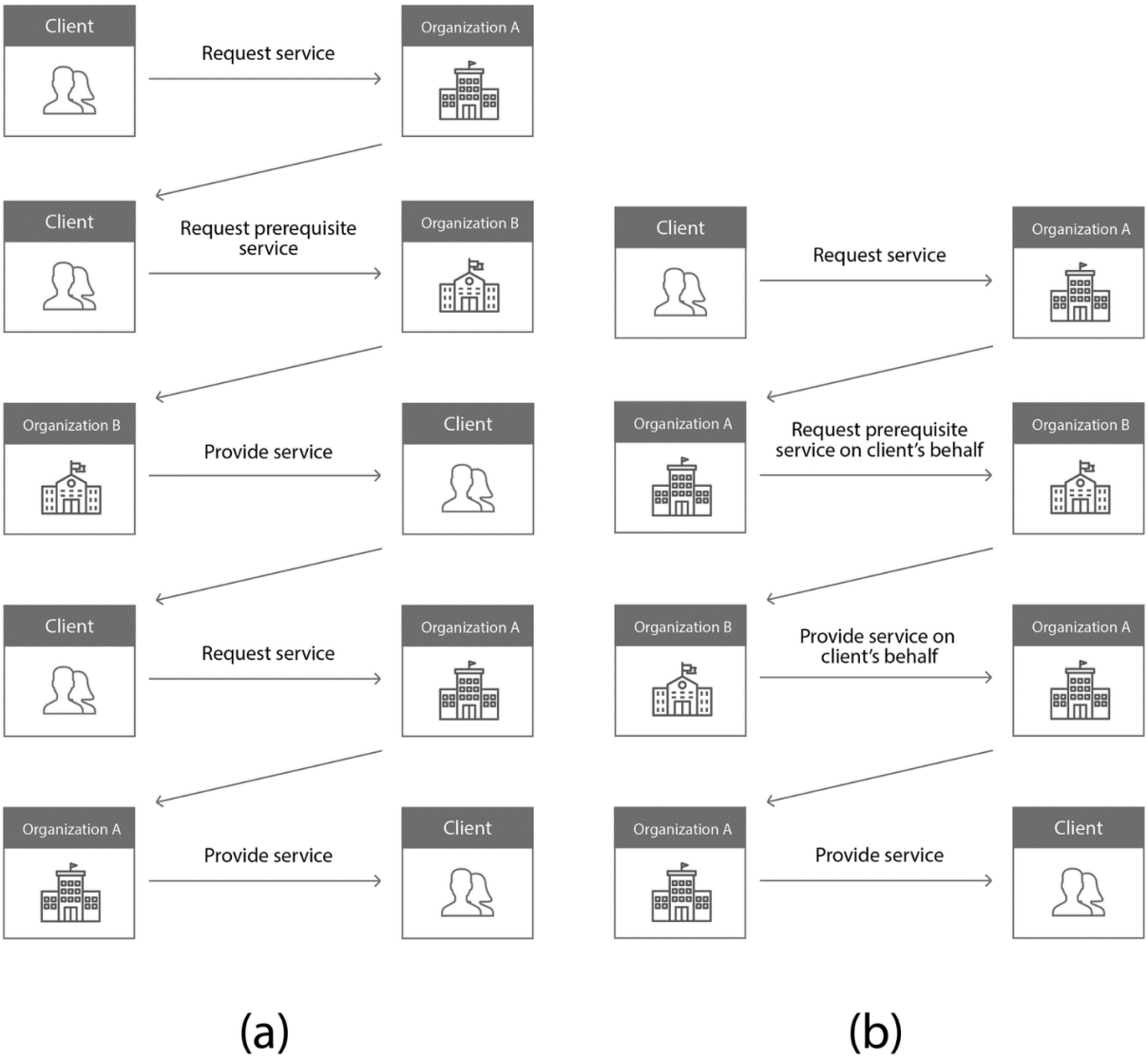
4.4: Collaboration between institution:

A few studies are discussed in the subsequent sections to highlight how bitcoin, a particularly certified blockchain, reveals itself as a proper strategic integration solution in real-world business circumstances.

The very first instance to be evaluated is that outlined in the study by Bedim et al., wherein a local utility company aims to integrate and work closely with support systems that can assist

customers who are having trouble affording about their power bills in order to significantly reduce power outages and improve customer satisfaction.

Clients are often uninformed of the existence of services that aren't acceptable, which contributes to disconnection. Furthermore, requesting assistance through one of the existing systems is a time-consuming and inconvenient procedure. The process at the start of the study involved paper copies of late credit warnings, personal visits to support programmers, and extended long waits för answers on lengthy inquiries. [7,39]



Traditional (a) and blockchain-accredited service delivery (b)

The power provider regulates the service plans equally, which implies that the service plans weren't in the course of giving power to its clients, and the power supplier refuses to offer Pell grants to them. Aid programmers, on the other hand, frequently offer a number of resources in addition to cash assistance in the event of late power payments. Those businesses will

collaborate in a unified system, with the service firm directing clients who require the programmers' services. Such systems can react by assuring that such app is paid appropriately for the benefits it brings to its clients while also ensuring that electricity is maintained.

the relevant statute, according to which the service provider will guide clients who require programmed services. Such systems can react by providing also that service is paid appropriately for the benefits it provides to its clients while also ensuring that electricity is maintained. [3,14,40]

4.5: Learning is earning:

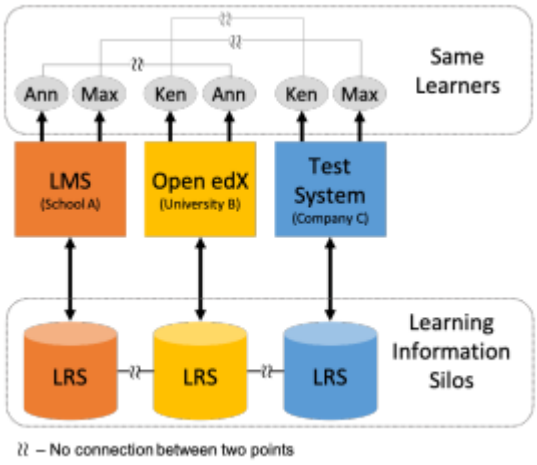
Learning in lock chain is progressed by taking the new steps

4.6: Secure and sustainable:

the blockchain can contribute to the SDGs in a variety of ways - from providing food vouchers to refugee camps in the development of facilities and land registrations to improve access to national identification.

4.7: BOLL deploying:

The Bitcoin of Training Records (BOLL) platform is a public ledger that links student learning records to all of the schools they've attended in a unified, accessible, & continuous book. Traditionally, many colleges and learning forums keep and administer their own learning records independently, as shown in Figure 1, without using the conventional method of moving education records through one place to the next without replicating customer data. As a solution to the situation of having, the BOLL scheme is introduced. As pupils migrate from one university to another, educational data is shared across universities. It also tackles the problem of bad starts in training assessment programmers when a fresh early education habitat is built before prior online courses being known, even if their 's learning engagement is founded off our prior educational career. [14,36]



Current learning systems design.

5. Frame work:

5.1: Learning users, educational authorities:

This article examines the benefits and drawbacks of implementing block chain in the academic sector. The most important blockchain-in-education applications discussed are digital creation and classification of educational certification and development and lifelong learning motivation. [23,39]

5.2: Centralization transability and consensus:

It requires a participatory node to verify that the work done and submitted by them is eligible to receive the ability to create ’s blockchain deals However, this whole bitcoin mining method requires the use of high power and long processing time. [26,38]

5.3 Permit authorization:

It may earn money through online license and control museum running costs if it can deliver digital exhibitions and collections under the principle of "trade secrets" and "traditional property ownership," but also renting and actually contributing in multiple industries. [10,30]

5.4: Martin Ortega citizenship:

By combining the benefits of DSM with blockchain technology, Li and Li (2019) introduced a DSM game theory model within microgrid networks developed by blockchain, and identified payment methods and intelligent segmentation controls.

5.5: AVL+ is used:

I present a suitable light client solution that can secure blocks - AVL + tree. Instead of storing N pieces of data, it requires the client to keep 1 hash (specifically identifying the status) and obtain proof of the size of the log (N) and each function or block. The client can ensure that the proof is made from the same condition the client root hash refers to. This allows for the implementation of a guaranteed light client on smartphones and other devices that can maintain full status. [21,35]

5.6: Information exchange, improve validity:

There is a chance that the blockchain will dramatically change the future of healthcare education and drastically change the way patients, professionals, teachers, and students communicate about safe, legitimate, and accountable information.[40]

Limitations

Blockchain technology is in its embryonic phase so many challenges had to face while adopting this technology in education system. Due to lack of interest and lack of knowledge adoption of blockchain technology is not rising up rapidly. By proceeding day by day transactions size of blockchain becomes bulky hence, making it some slow in speed.

Before providing data to blockchain ledger it should be secured which is sometimes not possible. The majority of proceedings are still printed on paper or in other physical formats; however, governments and businesses around the world are working to convert them. Someone can provide proof of first publishing by uploading hashes of documents to a blockchain without really wanting to disclose the document or invention being written. This flips traditional ideas about copyright and legislation on its heads, allowing for a far more limited system in which data can be secured while not being shared.

CONCLUSION:

In this review we discuss all blockchain centered educational projects and blockchain features used by these developments. Implementation of these blockchain based educational projects can solve many problems faced by education departments.

This technology is on its starting phases but if we implement these projects then we can easily handle the issues faced by students. This technology can fetch much more improvement in coming days.

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