An Investigation on Higher Education System through Blockchain Technology: A Survey

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***Abstract*-** Data is divided into blocks using the Blockchain technology, and each block is protected using a different cryptographic technique to maintain privacy and security. A chain is formed by the blocks' mesh topological connections to one another. The use of blockchain is beginning across a variety of industries, including banking, the government, the military, and education. In this study, we wish to examine how blockchain technology has impacted colleges in terms of information and technology in order to raise the standard of universities. Reviewing earlier research publications that are relevant to the study is the process utilized. As a result, it is anticipated that this research will make a positive impact by helping to solve issues with blockchain implementation in higher education, namely how to utilize the system, what blockchain is, and how to transform disruptive technology into current technology.

***Index Terms*-** Blockchain Technology; Higher Education; Smart Contracts; Record keeping.

I. INTRODUCTION

Blockchain is a ledger because it can hold information from several transactions in order to be reliable and validated. Nodes in the system's peer-to-peer networks will confirm fresh blocks as part of the communication process. Blockchain was originally introduced as a system to control Bitcoin, but now it does has evolved to the point where it can be considered a deployment technology for a variety of decentralized applications. Blockchain technology eliminates third-party intermediaries, verification and direct trade. Blockchain technology advancements can be divided into four categories i.e., Blockchain 1.0, 2.0, 3.0, 4.0. Blockchain 1.0 was first widely used foreign exchange payment system, micropayment, one-to-one virtual currency. Blockchain 2.0 will enable smart contracts, securities trading, smart properties, payment settlements, banking products and many other areas of finance. Blockchain 3.0 focuses on regulation and governance of blockchain applications like government, Healthcare, Science and Technology, Culture and Arts [13]. Blockchain 4.0 can decentralize IT systems and integrate businesses, Work on cross-blockchain business processes that support supply chain management, financial management system, workflow management, asset management [2] [12]. Distributed and decentralized technology, blockchain technology addresses key issues such as: i) to ensure the integrity of the information; ii) temporarily; Linkage; and iii) Anonymity of Participating Entities. We also use protocols to resolve disputes. The characteristics and applications of blockchain technology have been identified in relation to educational contexts. One of the most widely referenced studies, for instance, characterized the technology based on the platform built utilizing blockchain technology known as EduCTX. This platform serves as a reliable, decentralized higher education system worldwide, global acceptance of the grading scale and credit transfer for students in Higher Education Institutions (HEIs), along with additional prospective stakeholders including businesses, institutions, likewise organizations. This study offers a thorough analysis of the existing literature on blockchain technology in education to provide a comprehensive grasp of the current situation in terms of advantages, problems, and current Blockchain applications of technology and potential future uses of blockchain technology in the field of education. Despite some academic research on using blockchain in education has been carried out in recent years, but no systematic review has been completed. Thus, this essay adds to the body of knowledge about the current use of blockchain technology.

II. BACKGROUND AND RELATED WORKS

Three specific ways in which blockchain may provide challenges to higher education institutions were covered by researchers Haugsbakken et al. [8] in their study. They identified three significant issues that higher education institutions (HEI) should take into account when deciding how to use blockchain technologies. The first discusses the ways in which HEI blockchains democratize and automate several types of readily accessible university data. The second is on the different ways that blockchain technology may be used to reduce expensive and growing university bureaucracy and support systems. The third has to do with what we refer to as adoption gaps in technology for blockchain technologies. The approach used by Fernado et al. [15] is to apply a blockchain-based solution, the Blockcerts solution, to store diploma data. In this way, everyone can control and visualize their data. They deployed a prototype and discussed the impact of the technology and the underlying business processes. The researchers Harthy et al. [1] concentrated on the fact that institutes of higher education are permitted to operate campuses in various cities and nations. Security specialists therefore see protecting data transfers like student profiles and certificates as a major responsibility. By identifying the usability areas and noting the best implementation recommendations, they were able to emphasize the prerequisites and procedures for the deployment of Blockchain technology. The researchers Riya Widayanti et al. [16] looked into the linked prior study articles. They want to

expose the effects that blockchain technology has had on information and technology that can be used to raise universities' standards and encourage students' potential so they can compete both locally and internationally. Researcher Raimundo et al. [11] reviewed in the main subject areas, reviews include higher education and students, surrounding notable sub-themes. The review suggests that research has sought to generate new knowledge to improve sustainable innovation and smart contracts for students and universities based on the effectiveness and efficiency of Blockchain Technology processes and data management. Preeti Bhaskar et al. [4] purpose of this research is to systematically review and present the current research literature that has either quantitatively or qualitatively investigated the use of blockchain technology in educational settings. The authors tried to deal with this form with well-formed steps. From the table of recommended reporting units for systematic reviews and meta-analyses (PRISMA) and clear mention of data search and inclusion and exclusion criteria for the study examined. Primasatria Edastama et al [7] analyzed the usage of the blockchain technology in the higher education system. Their research where they discussed the results which lead to the usage of the blockchain in higher education which is the new trend lately. They have stated that the implementation of blockchain in higher education creates various problems in the usage of the blockchain technology. They have explored the various applications of higher education related technologies. They have stated that the technology functions used to record small transactions, recording transactions, documenting and voting, which is even used in higher education, is not well implemented. Their goal was to prepare a research paper that supports other researchers with the information on the use of the blockchain technology which can be used to record transactions in various sectors. Timothy Arndt [3] has given an overview of other recent papers where the research lies on the application of blockchain in the higher education and their thoughts on those researches for the people who are interested in these areas and the impact on the higher education in the future due to the blockchain technology. He has stated that the technology can positively impact or negatively impact the higher education the near future. His goal is to provide a position paper in this area of research. Tao Wu et al [17] proposed a framework for the blockchain application in the higher education and also suggests the establishment of consensus mechanism and the usage of smart contracts. They proposed a solution to connect schools, teachers and students through the use of smart contracts in an ethereal structure to obtain a fair distribution of the education resources through reward weit and to stimulate the student's performance in that team work through the use of weit reward. They have suggested the higher educations should use the blockchain technology method, that is the consensus mechanism of PoS in order to differentiate the instructors based on their experience and to differentiate students on the basis of their learning advantages, so that the students can have a competitive incentive. Bucea et al. [5] sought to better understand the state of blockchain applications in their study paper. Their study of blockchain technology concentrated on the impact of incentive on teamwork, which improved learning outcomes in higher education institutions (HEI). They looked at the research information acquired from 150 students at three institutions in Portugal, Serbia, and Romania. Researchers discovered that blockchain-based technologies, as well as motivation, cooperation, and student participation, were significant variables in enhancing student learning results. Based on blockchain technology, Turkanovic et al. [14] suggested the worldwide higher education credit network EduCTX. The European Credit Transfer and Accumulation System (ECTS) serves as the foundation for the platform. It created a credible, decentralized system for higher education credit and grading that is accessible to all prospective stakeholders, including businesses, institutions, and organizations, as well as students and higher education institutions (HEIs). They demonstrated a proof-of-concept version of the environment built on the open-source Ark Blockchain Platform. EduCTX will process, administer, and govern ECTX tokens, which stand in for the credits that students earn for passing courses like ECTS, based on a globally distributed peer-to-peer network. The peers of the blockchain network are HEIs. The platform is a first step towards more open and cutting-edge higher education institutions. Radanovic et al. [10] stated that scalability, smart contract security, and user adoption are currently problems. Blockchain technology is expected to significantly alter how schools, colleges, and universities communicate with one another and, ultimately, with their students and connection to society. Duan [6] and his research team discuss how they want to use blockchain technology to achieve their graduation goals. They talk about their paper as they using blockchain technology for student chains and chain of courses to improve student experience and reaching the necessary level of knowledge. In addition to make sure the evaluation procedure was conducted correctly.

a) Existing Methodology:

Primasatria Edastama et al. [7] research paper used the methodology of descriptive methods and literature study to obtain the desired results and also discussing them. One of the descriptive methods that they have implemented is the illustrative way which is used to obtain information by studying them and carrying out the research process of the discussed problem. Another method that they have used is the literature study method where related articles are combined and used for comparing results or to derive results from them. Timothy Arndt [3] used the overview methodology that is the survey of various related articles of the supposed title that is 'Blockchain in Higher Education'. The authors have collected a wide range of the articles related to the title and also presented their ideas on those researches for the people who might be interested in understanding or researching the topic at hand to see the impact of it on higher education in the future. Tao Wu et al [17] have presented a framework for the application of Blockchain in the Higher Education and also suggested an establishment of one of the suitable consensus mechanisms and the usage of smart contracts. They have presented seven scenarios in which blockchain is recommended for most of the higher education applications. They have also proposed the application of having offline and online blockchain in the higher education. They have proposed a framework for alternative credit usage, anonymous trading, smart contract issuance and unified mining for on-campus use. Raimundo et al. [11] used a methodology that provides a Systematic Bibliometric Literature Review (LRSB) of the applications of blockchain for research in the higher education fields. They have performed a review by

integrating 37 related articles to the topic which presented the latest updates and knowledge on the ongoing implications pertaining to the usage of blockchain technology for the improvement of higher education processes. The LSRB results indicated that the blockchain is being used to construct new interventions to enhance the previous ways of securing, delivering and sharing personal data of students and knowledge. Preeti Bhaskar et al. [4] have conducted an analysis based on bibliometric which was conducted on the data in publications, journals, citations and authors that were collected by them and were examined by the application of the bibliometric measures. They collected the data from SCOPUS database by using the topic 'Blockchain Technology in Education'. Fernado et al. [15] have created an approach using the blockchain technology which was implemented in the University Fernando Pessoa and also discussed the challenges in the security domain and the implementation which was raised by the usage of the blockchain technology. They have proposed the adoption of blockchain solution named 'Blockcerts' for the storage of diploma information which will enable anyone to view and authenticate their information. They further have implemented the prototype and discussed the technology's implications and of the underlying business processes. David et al [9] have created a model which can be implemented in any higher education training institute to adapt their teaching to the specific needs of the professional profiles that are validated by the employers in the education sector. They have validated this model by preparing a prototype which gave more than acceptable results. The prototype they have prepared is based on Ethereum created to implement the approach they have suggested. Harthy et al. [1] have used a methodology of literature review where they conducted a research based on the qualitative method by gathering various studies and analyzing them and recording their findings in this paper. Haugsbakken et al. [8] used the methodology of discussing the issues and questioning the blockchain technologies whether they can democratize and automate learning processes, reduce costly bureaucracy and be adopted in the higher education or not. They have discussed three challenges in three ways which can challenge the higher education institutions. Riya Widayanti et al. [16] have used the methodology of reviewing the previous research papers related to the topic in hand by conducting the literature review method to determine the impact of the technology on improving the education universities. Turkanovic et al. [14] have presented a prototype implementation of the said platform that is the EduCTX which is a credit platform in the global higher education. The platform is based on the concept of European Credit Transfer and Accumulation System. Bucea et al. [5] have used the observation of the participation, a case study model and state of the art evaluation as the methodology to discover the findings and results. This paper also uses the method of survey which was conducted among college students, and document analysis was done. After receiving the results and findings a thorough literature review and qualitative analysis was conducted overall which uncovered some new info that aided their fact-checking efforts by being useful in verifying their findings with additional data sources and by exploration of alternate explanations.

b) Analysis of Existing Methodology:

Our study's goal is to comprehensively review and present the corpus of research literature that has either quantitatively or qualitatively investigated the usage of blockchain technology in educational contexts. The report highlights how the technology is used in supporting management of student activities, including administration and teaching and learning using a thorough analysis of the activities at the school, college, and universities. The methodology taken in this research paper is Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA). It is a well-defined and formulated strategy devised by the authors. Given below are the following steps included in the method are as follow:

Step 1: Searching the Database

In order to find published studies that fit our study's aims, we as the contributors of this paper gathered various literature paper from Google scholar, for further analysis and reviewing different methodologies.

Step 2: Visualizing examination

Next, we determined which articles were pertinent to the topic and omitted those that weren't.

Step 3: Analyzing the content

In the last stage, we reviewed the chosen research articles and review papers methodically, doing the content analysis of significant publications by looking at the goals, processes, and conclusions of the work.

Table 1: Existing Methodology

Reference paper	Year	Domain	Methodology
Primasatria Edastama et al. [7]	2021	Blockchain in Higher Education in 4.0 era	Descriptive methods like illustrations and Literature Survey method by collecting related articles and comparing results and performing discussions.
Timothy Arndt et al. [3]	2019	Blockchain in Higher Education	Overview methodology where survey of various related articles of the title 'Blockchain in Higher Education' is carried out and presented ideas.

Tao Wu et al. [17]	2021	Blockchain based Smart Contract in Higher Education	Framework of the application of Blockchain in Higher Education by establishing consensus mechanisms and using smart contracts.
Raimundo et al. [11]	2021	Blockchain System in Higher Education	Systematic Bibliometric Literature Review (LRSB) performed on applications of Blockchain in Higher Education fields by reviewing and integrating 37 related articles.
Preeti Bhaskar et al. [4]	2020	Blockchain in Education Management	An analysis based on the bibliometric conducted on wide range of data collected and were examined by applying bibliometric measures.
Fernado et al. [15]	2019	Blockchain Technology for Higher Education	An approach using the Blockchain technology implemented in university and discussion of the challenges along with the implementation of the prototype.
David et al. [9]	2019	Blockchain based Approach in Higher Education	A model implementation in any higher education training institute and validation of this model by preparing a prototype based on Ethereum.
Harthy et al. [1]	2019	Blockchain Adoption Solution in Higher Education	Literature Review conducted on various studies based on qualitative method and analysing and recording the findings.
Haugsbakken et al. [8]	2019	Blockchain Challenges for Higher Education	Discussion of issues and questioning blockchain technologies by discussing 3 challenges and inviting researchers for discussion.
Riya Widayanti et al. [16]	2021	Impact of Blockchain in Higher Education	Literature Review conducted by reviewing previous research papers to determine the impact of the blockchain technology on the improvement of education universities.
Turkanovic et al. [14]	2018	Blockchain based Higher Education Credit Platform	A prototype implementation of EduCTX Platform, a credit platform, in Global Higher Education.
Bucea et al. [5]	2021	Blockchain Technology Enhancing Higher Education	Literature Survey like observation of participation and state of the art evaluation along with a case study model and survey among college students where the results went through document and qualitative analysis.

Out of the Research Papers which we covered during the related works section, we shortlisted four of them which have a unique methodology and after a thorough study and analysis of those methodologies we came across these differences in their approaches and proposed methodology with their results. Then, finally ending the comparison with their approach's conclusion.

Table 2: Analysis of Existing methodology

Reference paper	Year	Methodology	Framework	Results	Conclusion
Primasatria Edastama et al. [7]	2021	Descriptive methods like illustrations and Literature Survey method by collecting related articles and comparing results and performing discussions.	Proposed a conceptual framework design which is based on the approach of systems by dividing it into 3 elements namely input, processing and output. The input element has 3 shareholders. The processing one has work evaluation process for digital competencies via E-portfolio and are recorded into blockchain. The outer element can be appraised for hiring in labour market.	The findings of this research paper which was obtained by performing the steps used in the framework proposed by the authors are as follows: written reports were 100%, employer assessments were 66.67% and integrated rubrics was 44.44%	They concluded their research paper by explaining that the usage of blockchain technology in the higher education is a very optimistic new breakthrough in the 4.0 era revolution. They further listed some of the benefits of having these technologies in certain areas to improve security and carry out work with ease.
Tao Wu et al. [17]	2021	Framework of the application of	The framework is for smart	A smart contract issued by a	The authors have concluded their paper by stating that the

		Blockchain in Higher Education by establishing consensus mechanisms and using smart contracts.	contract issuance, alternative credit usage for on-campus use, anonymous trading and unified mining and is mainly used by universities. The process involves issuing a teaching task using smart contract and the usage of consensus mechanism and a complex team task process.	teacher requires a tutor to answer a bid and form team to complete. Students who have gained extra weit based on their academic performance in studies can prioritize and can issue a new smart contract. It was found that the framework is reliable.	blockchain + higher education is a real trend during these years and is becoming one of the most searched keywords. They further stated that they tried to bring the schools, tutors and students together through smart contracts to gain fair distribution of the educational resources.
David et al. [9]	2019	A model implementation in any higher education training institute and validation of this model by preparing a prototype based on Ethereum.	The model prepared by the authors is named as the Confidence model which is based on blockchain to authenticate the acquisition of competencies. The parties in this model are trainer, student, verifier and employer. These parties interact as the central point with the blockchain. This model is verified by preparing a prototype based on Ethereum	The algorithm, system and technology described along with the prototype is tested using the model involving 4 institutions. The results obtained showed that the prototype worked with total efficiency with several billion users in the networks. The operations given for the platform to complete were done within a second which shows the platform is very efficient.	The authors of the research paper concluded by stating the advantages that were received by the implementation of the model. The benefits were reliable verification and guarantee of the training with the actual job situation and present needs of the market. They further stated that the model has a high range applicability in any kind of scenario.
Turkanovic et al. [14]	2018	A prototype implementation of EduCTX Platform, a credit platform, in Global Higher Education.	The framework here is that of a platform known as the EduCTX which is a credit and grading platform. It works by processing, managing and controlling ECTX tokens which are considered as the credits for academics. These tokens are earned accordingly by students who complete a certain course. In this way the framework works where the student with higher credits/tokens can earn benefits.	EduCTX platform was created to add transparency and also automation in order to progress the process of administration related to higher education systems on the global scale. This platform also validates companies and organisations where the employers can check the accomplishments and requirements of the employees and recruiters in a transparent way.	The authors concluded the research paper by stating that the platform is created as a trusted higher education credit and grading system in the global scale. It addresses a globally unified viewpoint for companies and students likewise. They stated that the platform transfers the grading system from digital ones to simplified, and efficient version.

III. PROBLEM STATEMENT

One of the issues that comes in the field of blockchain is in the diploma revocation. Although this is a rare procedure, it can be used special situations in which diplomas are revoked. However, a diploma published on the blockchain cannot be changed Several solutions have been proposed, e.g., the publisher provides a list of canceled diplomas. In this case, authentication depends on the availability of the publisher, which is exactly this approach want to avoid on blockchains other than Bitcoin alternatives have been proposed, such as Ethereum, this can be achieved through smart contracts. A similar problem is necessary in some situations the last date of validity of the diploma. Solution here the problem must be similar to the previous one Viewers are also different in terms of implementations and can display different information to users who don't strain credibility. Future viewers should be standardized so that users get the same regardless of the selected viewer. In some countries that adopt data protection laws, there may be problems with its immutability blockchains that do not guarantee the right to be forgotten for example.

IV. ANALYSIS OF EXISTING ARCHITECTURE OF HIGHER EDUCATION SYSTEM

Blockchain can be used for many purposes in higher education, such as the following:

(i) Record Keeping: Maintaining student records is an extremely expensive and time-consuming task that can be completed utilizing blockchain technology with little effort. Personal information such as name, identification, address, etc., information about courses taken and grades, information about degrees and certificates received, and information about courses attended and marks are all protected on blockchain platforms and transparent for all counterparties. Since 2017, MIT has taken the initiative to implement the blockchain-based storage for the diplomas. Based on blockchain technology, professors may patent and protect the ideas, innovations, and intellectual property used in their classes. Therefore, the issue of plagiarism is easily resolved. Additionally, the plagiarized research papers will be found very quickly. Professors will stop the online distribution of copyright courses by encrypting them and storing them in a safe chain. Authorized network users will have access to the data. Since the Internet destroyed the space and time limitations, educational institutions must contend with intense competition. Students must overcome obstacles related to national and international accreditation in order to enroll and participate. Additionally, new qualifications like digitalization, hybridization, entrepreneurship, social inclusion, green and circular economies, etc. are brought about by the post-COVID-19 context. Blockchain can simplify this difficult accreditation procedure, which will guarantee the global standard of instruction, learning, practice, and commercial communication. The ability of digital records to link the qualifications of various organizations with qualified, credentialed students is another benefit. Keeping files and all academic papers, including curriculum, research reports, projects, and diplomas, can be stored on blockchain by universities, assuring data security and lowering storage costs by using storage services.

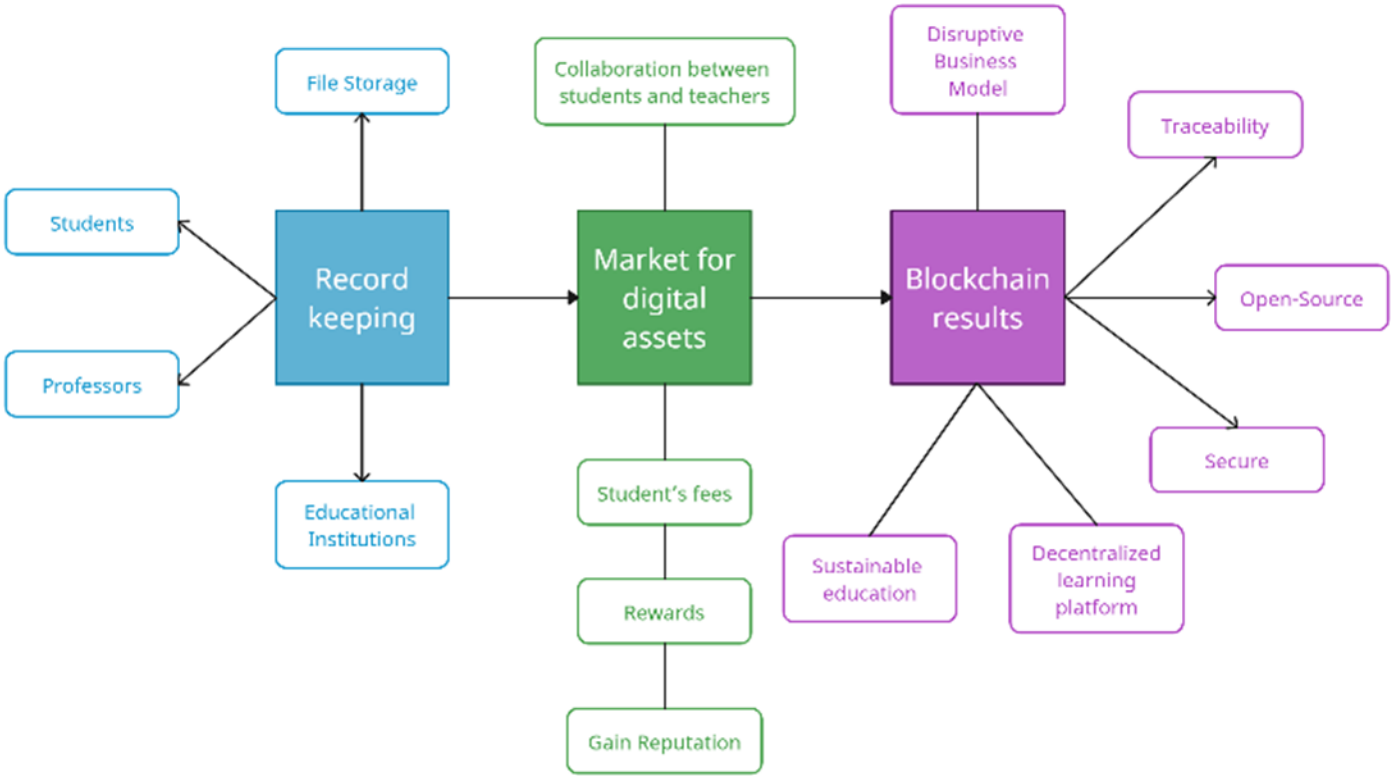

Figure 1: Blockchain Architecture for Higher Education System

(ii) Market for Digital Assets: The challenging task that is involved with student fees may include transfers between several parties, including students, parents, organizations that award scholarships, financial institutions, governments, and educational institutions. Universities already employ cryptocurrency, such King's College in New York City.

Mining cryptocurrencies might result in rewards. For instance, the computer node that continually verifies the accuracy of the data stored on a blockchain is rewarded with ether or digital tokens. Experts in various academic fields might provide the pupils digital badges as part of the parties' approval procedure. Hashing algorithms underlie their integrity and secrecy. The outcomes of study are something that both professors and students are interested in publishing in prestigious publications. There have been many famous instances of excellent papers that were turned down for publishing despite being highly inventive, challenging to grasp, or fearful of being fraudulent, etc., but ultimately went on to win awards for their writers. By utilizing blockchain

technology, this hassle may be eliminated. Blockchain technology can store all the information pertaining to issues, publications, authors, fees, etc.

(iii) Blockchain Results: Through the use of distributed ledger technology implemented on decentralized platforms in a secure environment, record control for student admissions procedures is made possible. Scalability: When attempting to expand the educational process globally, bottlenecks may be caused by the blockchain's poor transaction processing speed; Because senior and junior students can access lectures and events from all over the world through this online system, it helps to foster long-lasting relationships between students and faculty. By organizing carpools, lowering city traffic and bottlenecks, providing students with a safe and easy trip, and lessening the burden on parents, the administration of transport and hostel amenities for students and employees may be made simpler. Decentralizing online learning would guarantee that professors and students may communicate in real time, and the student may have the option to select from a variety of courses. In this decentralized system, courses are recorded in blockchains with intelligent contracts that are configured to run automatically when the predetermined circumstances are met. As a result, any instructor may grade assignments that the smart contracts on the blockchain can check automatically. Then, teachers are given cryptocurrency and tokens as compensation, and students can earn badges, credits, and a diploma once the program is over. It makes it possible to enhance existing blockchain-based platforms to provide all the amenities described above using the Blockchain technology.

V. RESULTS

The proposed methodology by Turkanovic et al. [14] EduCTX platform enables organizations as potential future employers the possibility to check the educational documents of potential employees in an open way. Universities are open, decentralized and an open way to validate documents for students and their duties. The platform has its own characteristics problems and shortcomings. In the beginning, there are only a few nodes some networks and can be seen as a security risk. However, we expect an increase in the number of HEI nodes and thus the security problem is minimized over time. Additional issues relate to proper storage and private key protection for all involved (e.g., student, universities). All participants are invited to participate protect and secure your private keys as expected when handling sensitive data. In this article, the researchers Tao Wu et al [17] proposed to connect schools, teachers and students through smart contracts in the etheric structure and fair distribution of educational resources reward and stimulate work results of students in a team work done by weit premium. It is recommended instead that Blockchain technology in schools should use consensus PoS mechanism. Smart contracts are a tool to divide tasks and transfer value, but the complexity of the contract depends on the designer.

The approach devised by David et al. [9] have various advantages of the underlying technology and is itself a major advance in technology, education, because it allows reliable control of the acquisition of students' skills and also ensures that education corresponds to the real work situation and the current needs of the market.

Primasatria Edastama et al. [7] suggests the use of blockchain technology in education is a promising new breakthrough moving into the era of the 4.0 revolution. Efficiency of using a blockchain that did not exist well executed is a challenge in its discovery process. There are 2 descriptions of the problem which can be resolved by two conclusions namely: First, Blockchain can provide secure database of student test results and e-learning system information because it can monitor large volumes of data.

VI. CONCLUSION

The aim of this study was to understand the scope of Blockchain application at a higher-level field of education. To achieve this goal, PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) was performed on a reputable digital device database according to particular protocols to indicate records eligible for review. The results were used to summarize the existing knowledge about Blockchain application different areas of higher education and summarizes current academic thematic trends work in this subject. Understand key and emerging insights and challenges compatible digital platforms to securely share and organize data, flexible smart contracts, affordable innovative projects and privacy/learning challenges for all involved in higher education management and learning processes. This knowledge should be considered in light of these limitations. First, an overview focused exclusively on articles available in peer-reviewed journals database of scientific articles published until 2020. Second, the overview was revised Blockchain as an umbrella keyword and didn't like matching keywords like smart contracts. These limitations can be addressed in future research additional interchangeable keywords to expand the scope of information. This study argues that there is a need to find solutions to performance and security issues such as interoperability and security of different platforms/algorithms. In addition, researchers should take a holistic perspective on blockchain adoption build legally and culturally appropriate ecosystems because culture is central when it develops customized and collaborative higher education solutions. In conclusion, our contribution is a detailed review of the recent literature on the implementation of Blockchain in higher education and its main challenges. These insights help researchers understand and more accurately identify key areas of research paths.

ACKNOWLEDGMENT

We would like to express our sincere gratitude to our advisor, Dr. Ravi Verma, for his invaluable guidance and support throughout the research process. Words cannot express my gratitude to my professor for his invaluable patience and feedback. Finally, we would like to extend our heartfelt thanks to all of the research participants in our study, who generously shared their time, experiences, and insights with us. Their willingness to engage with our research was essential to the success of this project, and we are deeply grateful for their participation.

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