Evolving a New Revolutionary Learning Environment Based on Blockchain Technology

M. Mohanasundari, P. Vidhyapriya, P. Sundaresalingam, R. Mughil

***Abstract*:** *Education environment is made out of numerous partners, both from open and private areas, for example, administrative sheets, government, and entrance advisory boards, testing organizations, authorizing, teachers and understudies who comprise the foundations. Instruction, the way toward encouraging learning, the procurement of information, ability, qualities, convictions, and practices which is empowered by the Blockchain innovation has picked up the consideration of specialists everywhere. Blockchain innovation has been applied chiefly in the banking, retail, enactment, exchange and business, flagging the fourth modern upset. Square chain is the rising innovation which pulled in each field of work and having a developing stage because of the highlights of decentralization, detectability, changelessness, and money properties. Like other segment, the blockchain innovation has additionally begun to step into the instruction field and had made prominent imprints, which will fill in as a grapple for what's to come. This examination follows the impressions of the blockchain in the instruction innovation and furthermore researches the headways in the training possibilities that would be advantageous. The orderly audit falls fundamentally under the clear cut clarification dependent on the different utilizations of the square chain in training, the positive and negative effects following the reception of blockchain innovation in instruction framework and the eventual fate of learning driven by the square chain innovation. This investigation examines in detail the ramifications of the blockchain dependent on the discoveries. The audit displays the present condition of information and framework concerning the blockchain based application in instruction framework.*

***Keywords*:** *Assessment, blockchain, credit transfer, curriculum, education, etc.*

I. INTRODUCTION

Blockchain is the center innovation used to make the digital money, Bitcoin, through the upkeep of changeless

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dispersed record in a great many hubs proposed by Satoshi Nakamoto in 2008. Bitcoin is the most celebrated square chain application, yet now been applied into different applications a long ways past digital forms of money (Zheng 2018). Square chain innovation is a developing zone of enthusiasm for both industrialist and academicians the same. Moderately an ongoing progression in software engineering, blockchain is an all inclusive, cross-industry and troublesome innovation which is estimated to fuel the development of the worldwide economy for the following a very long while (Grech 2017). Square chain innovation empowers the production of a decentralized domain, where exchanges and information are not under the influence of any outsider association (Turkanovic 2018).

As we as a whole know, instructive foundations have cornered the capacity of learning process, while students and instructors have no independence for the learning procedure and results (Duan, Zhong& Liu 2017). In training, Degree declarations affirm the accomplishment of certain learning results and are until today for the most part gave on paper or other physical organizations. There exists the grave issue of phony degrees, which is looked all through the world and this fraudulent practice has a billion-dollar industry behind it [Allen, John 2005].

Keen contract stage, for example, Ethereum could bolster small scale endorsements and standard degree accreditation inside higher instructive foundations (English, Auer 2016). In light of the idea of square chains the testaments would stay legitimate regardless of whether the giving association stopped to exist. In any case, there are some dull spots in how evaluations and degrees are resolved. Utilizing shrewd agreements put away in a blockchain for figuring evaluations is hazardous in light of the fact that there is no proper calculation for ascertaining them. Circumspection is utilized, and limits between groupings are adaptable (Rooksby & Dimitroy 2017).

This additionally includes the privilege from change from assessment of understudies' accomplishment to the post-work capability assessment, and the understudy competency assessment is send to the educational plan to gauge the learning results, which understand the ceaseless improvement of the educational plan (Duan, Zhong& Liu 2017). Block chain innovation offers open doors for headway in business and profession development. It is fundamental that understudies, staff, and colleges are to be equipped with the cutting edge front line advancements. In late times few colleges have started to create projects, courses, and gatherings to help development and instruction utilizing the cutting edge innovations (Kursh & Gold 2016).

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A potential reorientation towards supporting delicate abilities and creating understudies as entire people would have significant ramifications for the institute (Peter 2018).

As of late, gigantic open online courses (MOOCs) have been brought to open consideration. Begun in the US, MOOCs are created by driving substance suppliers like Coursera, Udacity and edX.

Notwithstanding the colossal ubiquity, the present structures and frameworks of online instruction have numerous imperfections even with an undeniably open and advanced Internet. To take care of the issues of online training, in particular poor affirmation, absence of acknowledgment and information in security block chain innovation might be utilized. At present, this innovation is for the most part applied to have trustable information stockpiling technique to record the understudies' learning procedure, unveil all learning information to the general population, and guarantee the security and non-alter capacity of the information (Sun and Wang 2018).

The square chain application has been expanding in an impressive volume now daily, yet the survey made on the utilization of the blockchain innovation in instruction is critical for the developing innovation as it will have the intended interest group of all scholastic and non-scholarly specialists, directors and others intrigued. In this way, this paper makes a unique and convenient commitment to the writing of instructive innovation by exploring how blockchain innovation is being used in training.

The structure of the paper is as per the following, Section 2 present about the orderly survey process that has been embraced in the investigation. Segment 3 shows the audit results. Area 4 gives a top to bottom investigation and discourse of the outcomes. Segment 5 features regions for future research. Area 6 talks about the impediments of this survey. In conclusion, Section 7 closes the paper.

II. METHODOLOGY

The guidelines provided by Okoli and Schabram which consist of 8 steps to carry out a systematic review is followed in this study.

A. Defining the Research Questions

The research questions where formulated based on the objective of the study.

1. What are the blockchain based applications in the education?
2. How blockchain technology has impacted the education process?
3. What are the future implications with block chain for educational purposes?

B. Searching for Relevant Articles

The way toward gathering the articles applicable to the target of the survey includes scanning for the exploration papers in major logical databases like, ACM advanced library, IEEE Xplorer, Sciencedirect, Taylor&Francis on the web, SAGE Journals, ProQuest, Springer and Web of Science. These databases are mastery and surely understood for its top notch articles. The date of last quest finished July 2019.Keywords utilized for the hunt were: "BLOCKCHAIN", "Instruction", "Brilliant CONTRACTS", and "Accreditations".

The Google researcher is utilized for gathering some more research papers. Be that as it may, a few wellsprings of Google Scholar are not peer-surveyed, so the pursuit is restricted to certain outstanding instructive/specialized distributers.

C. Inclusion and Exclusion of Articles

Subsequent to completing the hunt, the titles and modified works of the recovered articles are screened utilizing pre-characterized consideration and avoidance criteria. An article was barred if: (1) it isn't in the basic language of English, (2) the wellspring of full content isn't finding from on the web, (3) in instruction framework the blockchain innovation not yet applied, and (4) the examined application is certifiably not a viable one, i.e., perspective or supposition. The rest of the articles were added to End Note and copies were evacuated.

D. Data Extraction

A data extraction form was used to extract data from the included studies. The form was designed specifically for this review and was piloted on a sample of four papers.

E. Data Item Description

1. The paper heading
2. Name of the author
3. Type of the paper- e.g. journal/conference/workshop
4. Year of publishing
5. Authors' nativity
6. Application objective as stated by the author
7. Method of implementation of application.
8. Potential/ actual advantage.
9. Potential/actual disadvantage.
10. Scope of future improvements
11. Comments

F. Data Analysis

Data analysis was performed after the information extraction from the articles was finished. The removed information was investigated utilizing pre-decided fundamental targets of the examination questions. The topics included: application, effects, and future ramifications of use. For all of these fundamental subjects, there are a few sub-topics developed through the information investigation.

III. RESULTS

The numbers of articles were gathered from various sources and analysis was done based on the inclusion/exclusion criteria. Finally, 40 articles were included for the systematic review as per the objective questions.
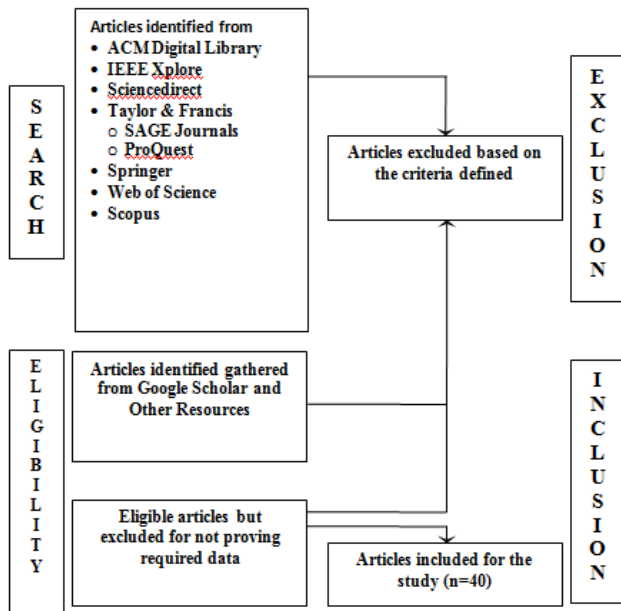
A. Publication year

The total of 40 articles included for the study has been published from the year 2012 to 2019. In which 48% of the articles published in the year 2018, 10% of the articles published in 2015 and 2016, respectively. 5% of the articles published in the year 2012. 2% of the articles published in the year 2019 were included.
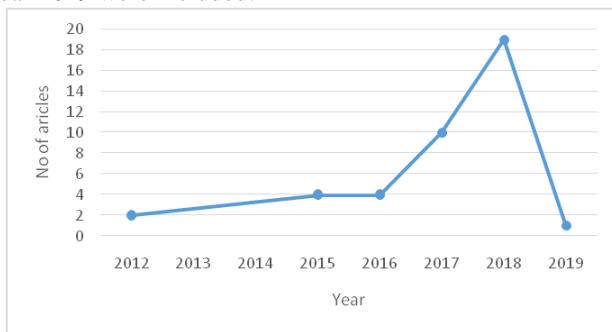
B. Publication venues

The research articles included for the systematic review has been published in the various venues like workshop, conferences, journals and colloquiums. 45% of the articles published in the Journals, 40% articles published in the Conferences, 7.5% articles published in the Workshops and Colloquiums, respectively were included in the study.
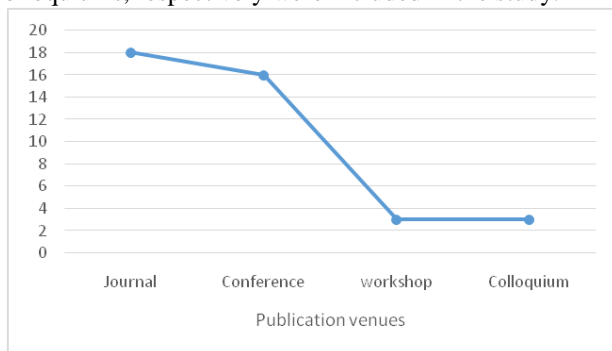
C. Blockchain based applications in education process

The application of the blockchain technology takes its stand in various aspects of education. In this study, the applications were classified as 12 major categories like, Certificate management, Assessment, Record verification,

Security, Record maintenance, Reputation, Curriculum, Online course management, Competencies and learning outcomes management, Competition management, Credit transfer, teaching and Enhancing students' interaction.

Applications	Articles
Certificates management	Bessa & Martins, Grather, Sharples & Domingue, Hughes, Palma, Skiba, Kolvenbach
Assessment	Hoy, Peter, Scheuer & McLaren, Arnold, Chen, Xu & Lu ,Duan, Wang.
Record verification	Nick Szabo, Kuvshinov, Grigore Albeanu, Palma, Arenas & Fernandez
Security	Kuvshinov, Chen, Xu & Lu, Mehrotra, Liu, Arenas & Fernandez
Record maintenance	Jirgensons & Kapenieks, Chen, Xu & Lu, Liu, Shrples & Domingue
Reputation	Turkanovic, Sharples and Domingue
Curriculum	Peter, Duan, Kursh& Gold
Online course management	Hori, Skiba, Chen
Competencies and learning outcomes management	Campbell, Rohaidi, Duan
Competitions management	Shen & Xiao, Wu & Li
Credit transfer	Srivastava, Turkanovic
Teaching	Chen, Xu & Lu
Student's interaction	Zheng

D. Impacts of Blockchain on Education

The reviewed articles highlight nine different types of benefits and challenges, which are listed below.

Positivity	Controversy
Avoid duplication	Affects traditional system qualities
Storage	Cost
Immutability	Technical barriers
Security	Feasibility
Employer reference	Scalability
Transparency	Adoption
Skill development	Privacy
Trust	Immaturity
Shared economy	Selfish mining
Sustainability	Efficiency

IV. DISCUSSION

The results of the gathered research papers shows the enormous interest and contribution of the blockchain technology in education but requires more research studies to support and improve the applications and benefits of the technology in the field process. As a whole, this systematic review of 40 research works was helpful in finding the state of art of the objective.

A. Blockchain Based Applications in Education

(Sharples & Domingue, 2016), referenced that "the University of Nicosia is the main advanced education

establishment to give scholarly declarations whose legitimacy can be checked through the square chain application, they allude it as Learning Passports as recorded by blockchain. There are a huge number of records and learning testaments, yet there are no frameworks to oversee them, (Bessa& Martins 2019) offered ascend to BcER2. Application covers extra regions in which computerized endorsements give fascinating open doors, for example, Corporate Training, Workforce Development, Current HR frameworks regularly don't associate with corporate databases, etc. (Grather 2018). On the Ethereum,blockchain, elements, for example, accreditation authority, confirmation specialists and certifiers are distinguished by their Ethereum addresses, this gives namelessness and ensures individual data, particularly of the certifiers, as it isn't effectively conceivable to associate an Ethereum address to a genuine individual, giving the better trustable framework (Hughes 2019) and (Palma 2019). Understudies who have gone to the tasks of MIT Media Lab and passed the evaluation have receivedcertification which has been put away on a blockchain arrange (Kolvenbach 2018 &Skiba 2017).

Learning As Earning (LAE) activity proposed by the Institute for the Future (IFTF) and the ACT Foundation(Wang 2018), the idea of Edublocks, which is like "credit hours" at present recording and surveying understudy learning. (Chen, XU and Lu 2018) referenced Sony Global Education utilizes blockchain innovation to make a worldwide evaluation stage for putting away and overseeing degree data (Hoy 2017). (Diminish 2018) survey learning investigation, the information are drawn from understudies' online exercises through virtual learning conditions (learning the board frameworks). Instructive information mining methods (Scheuer& McLaren, 2012) reveal semantically critical examples in these very enormous datasets to make probabilistic, prescient models known as understudy achievement calculations (Arnold &Pistilli, 2012). The main employments of learning examination were to advise mentor mediations for understudies who may be in danger of coming up short. (Duan, Zhing& Liu 2017) The learning result square chain with the understudies' capacity chain and the course chain.
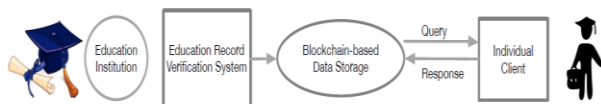

Figure 1: The Structure of the Proposed Solution

Education Records Verificationbased on the idea of keen agreement, proposed by Nick Szabo (1996), come into utilization lately with the presence of dispersed record innovation. The principle objectives of the Disciplina stage (Kuvshinov 2018) is to give a route to the understudies to effectively demonstrate their instructive records, propose to stay away from duplication of the records in the Student's advanced CV.

(GrigoreAlbeanu 2017)proposes the plausibility "to record for all intents and purposes everything of worth and significance to mankind, beginning with birth authentications and proceeding onward to instructive transcripts, government disability cards, understudy credits, and whatever else that can be communicated in code". (Palma 2019) utilizes cryptographic hash fuction framework for the colleges register understudies' scholastic occasions as exchanges in Ethereum blockchain and that a savvy agreement issues degree endorsements after recognizing understudies have satisfied all prerequisites for a degree.(Arenas and Fernandez 2018) Credence Ledger, a permissioned Blockchain-based stage for brought together check of scholarly certifications which grants an advanced rendition of understudy's qualifications that are effectively irrefutable utilizing digital money. It likewise introduces an open door for outsiders, for example, managers, to autonomously and secretly check shared scholarly verifications.

Every hub keeps up the security and precision of the data by keeping a total arrangement of records of past exchanges (Chen, Xu, &Lu 2018). The engineering of the Disciplina stage a space explicit Blockchain, structured by (Kuvshinov 2018) to go about as a decentralized record, with extraordinary respect for security and instruments of information exposure.

(Gilda & Mehrotra 2108) proposes the Linux Hyper Ledger model as suggested by (Liu 2018), utilizing Composer to deal with the important verification systems and agrees for access to an off-chain asset in a manner that is effectively versatile and trustless – giving unchanging assurances of precision and straightforwardness as a component of the framework, not prophets – all with clear procedure points of interest over existing simple frameworks. (Fields and Fernandez 2018) Credence Ledger actualizes spilling through Multi-chain for the security of the school records.

Once there is a perceived instructive blockchain, at that point people just as foundations could store secure open records of individual accomplishment, giving a solitary secure record of instructive achievement, available and circulated crosswise over numerous establishments (Shrples & Domingue 2016). (Jirgensons & Kapenieks 2018) Blockchain is a decentralized framework where data once entered is lasting. (Chen, Xu, &Lu 2018) It additionally records definite data about the clients' learning experience and pursues the advancement of their insight and aptitudes. each and every one of them can be changed into a kind of computerized money and put away on a blockchain system as indicated by a progression of extensive norms. (Liu 2018) prescribes a Hyper Ledger Fabric to execute a blockchain based Education – Industry helpful framework sharing understudies and manager subtleties.

Employers appear to benefit from blockchain-based instruction technologies help the businesses to discover appropriate competitors. Sharples and Domingue (2015) proposed a blockchain-based disseminated framework for instructive record and notoriety. An instruction foundation could remunerate a staff by moving some notoriety records to the staff. From when exchanges are put away on blockchain, all the notoriety alterations could be recognized effectively. Sharples and Domingue (2016) to open up the arrangement of insightful notoriety as of now connected with scholastics. There are as of now of instances of notoriety the executives at work in organizations, for example, AirBnB just as in instructive frameworks including iSpot, all the more questionably, notoriety could be exchanged, by being associated with scholarly grants, just as being set up as guarantee for significant thoughts or to approve the adding of new square to the chain. (Turkanovic 2018) The trust between disseminated hubs is worked through scientific strategies instead of the associations.

The University of Sydney, its new undergrad educational program for 2018 has been planned in the acknowledgment that graduates will change occupations a few times in their professions, so more extensive undergrad encounters will be required (Peter 2018). Another joined Bachelor of Advanced Studies empowers understudies to tailor their degree through interdisciplinary thinks about, online segments and commitment with tasks and research in network, industry or business enterprise settings. (Duan, Zhong& Liu 2017) The educational plan level chain alludes that the confirmation obviously accomplishment degree, assessment of the understudies capacity, the nature of the courses instructed by every instructor can be recognized by the outcomes unfavorably influence conditions, the consistent improvement of the educational program has been framed, the object of progress is educational plan, the accomplishment degree is assessed by understudies.

To satisfy the changing prerequisite of the understudies, (Kursh& Gold 2016)Universities appear to approach FinTech and Blockchain in various manners, including courses, degree programs, address arrangement, and training camps; shaping its very own bitcoin understudy clubs to assist understudies with jumping further into the universe of FinTech and computerized cash. Simon Fraser University in British Columbia, for instance, has even ventured to such an extreme as to begin tolerating Bitcoins as installment in its book shops and even introduced BTMs (Bitcoin Teller Machines) around grounds to give understudies a strict hands-on digital currency learning condition (Kursh & Gold 2016).

(Chen, Xu, Lu2018) noticed that Massachusetts Institute of Technology (MIT) and the Learning Machine organization collaborated to structure an advanced identification for web based learning dependent on blockchain innovation (Skiba 2017). Inventive Higher Education with Learning Objects CHiLO (Hori 2018), Using the SNS as a UI, the posted article is recorded in - blockchain, and by consolidating the put away

articles, a digital book is assembled and gave. The CHiLO Chain has adjusted Mastodon for the SNS and Hyperledger Fabric as the blockchain convention.

Instructive thought of OBE result situated (Duan, Zhong& Liu 2017), when the file purposes of graduate necessities set by majors are done, it arrives at the alumni standard and could grant recognition to students, which is advantageous to fabricate basic educational system not restricted by space-time. In Holberton School (a PC school in San Francisco) and Ngee Ann Polytechnic (a professional school in Singapore), understudies record their scholarly qualifications in the blockchain, oversee them as their learning results, and use them for work chasing purposes (Campbell, 2016; Rohaidi, 2017).

The advanced education operation sandbox, applies blockchain innovation to successfully disentangle the challenge procedure and improve rivalry productivity. Simultaneously, the validity of the challenge is settled by the qualities of framework straightforwardness and information non-tampering. The issue that the scoring procedure is non-straightforward, bad form and the conclusive outcomes are anything but difficult to be changed, an online test plan dependent on Double lay Consortium Blockchain is proposed (Shen& Xiao 2018) in which the open check of understudies' answers and record following of the challenge and conclusive outcome investigation is done deleberately. The operational aptitude assessment model proposed by Wu and Li (2018), where the scores of the challenge are the test are assed as same as the specialists score tried with the determined score.

The utilization of the blockchain (Srivastava 2018), allotting credit for finished courses by understudies, checking the credits given by different establishments, creating computerized marks, advanced declarations, testament confirmations utilizing the multi signature address convention in blockchain. As suggest by (Turkanovic 2018) the bigger instruction reviewing framework is created with Erasmus (understudies' trade) program utilizing European Credit Transfer and Accumulation System (ECTS) structure. Another system fork for the scholarly credit preparing, overseeing and controlling is the EduCTX blockchain P2P network platform which is all inclusive appropriated, where companions of the blockchain system are HEI and recipients of the stage are understudies and associations (for example organizations as potential managers).

(Chen, Xu, Lu 2018) records educators' encouraging practices and execution in this manner giving a reference to instructing assessment. In a word, for the two students and educators of the blockchain innovation has incredible potential applications in instructional structure, practices recording, and examination just as developmental assessment. Improving students' collaborations in the e-learning frameworks is named another application class that embraced blockchain innovation to comprehend a few issues identified with understudies' intuitiveness in the e-learning condition.

(Zheng2018) proposed a potential application dependent on the blockchain procedure. This application was structured so as to improve learning engagement. It gives remunerates as virtual monetary standards to the top positioned students dependent on predefined arrangements conveyed on the blockchain organize.

B. How blockchain technology has impacted the education process?

Benefits

All students' educational data would be integrated into blockchain ledgers through the block chain technology implemented in the educational institutions. The chances of students educational record modification for the legitimate reasons would be removed through the immutable feature of blockchain technology, which acts like a double-edged sword (Chen, Xu& Lu 2108) & (Rooksdy&Dimitroy2017). Simply stating, the brilliance lies in the structure of Blockchain technology where all transactions are recorded as a single entry and duplications or discrepancies is not possible.

(Sharples & Domingue 2016) All transactions recorded is viewable to all yet immutable as, the network must met consensus before each transaction may be recorded. There is a verification service that allows third party's verification of the authenticity of certificates, the identities of certification authorities and certifiers stored in the blockchain immutably (Grather 2018).

Counterbalancing cost of getting the hang of utilizing distributed systems administration (Han, Li and Baba 2018).(Jirgensons & Kapenieks 2018) Moreover, the colleges would profit: it is a method for reducing regulatory expenses and bureaucratic techniques while adding security to the upkeep of understudy records (Matthews, 2017).There are focal points for colleges: other than the cost cutting and expanded security gives previously noted, colleges would not have to go about as certification guardians for understudy populaces. Besides, there is a developing interest for aptitudes update that is truly making learning long lasting that requires perpetual, confirmed documentation.

(Zheng 2018) and (Kolvenbach 2018) another trust relationship is made by empowering the future bosses to get to this advanced learning information arrange, which fills in as a proof of the understudies to demonstrate their qualifications to the businesses in the prospective employee meet-ups (Wang 2018).

The scholastic guide in a Learning as Earning organization will concentrate on helping understudies to win the most "wages" in their portfolios. The advantages of this learning record incorporate course appraisal, educational program improvement, and in ULE biological system are the components of contact with understudies and instructor (Wang 2018).

(Han, Li and Baba 2018) The manual record following and the board are not required any longer, and the information from various suppliers could be given straightforwardly.

(Wu and Li 2018) Easy for the client from the instructor side it is a site page that embraces a side menu bar structure to choose distinctive practical modules and from the understudy side only a work area application. Blockchain and different administrations are as a spring up window, which is advantageous for various understudies. So the framework meets the necessity of convenience.

(Liu 2018) proposes another path for colleges and endeavors to share data straightforwardly, which accomplishes data evenness among understudy expertise and learning data, requests of big business enrollment and current market patterns.

Companies convey particular preparing, ability appraisal, and expert confirmation. Frequently corporate preparing and affirmation is keeping pace with college principles (Judd 2018). BC gives a versatile conveyed P2P framework thinking about how conceivable it is to collaborate with peers in a powerful way; it helps in accomplishing the ability advancement through viable association and correspondence (Bdiwi 2017).

Blockchain advancements may be gainful between colleges on the off chance that they will make the approval of various applications, (for example, for a PhD) simpler and dependable. Anyway colleges utilize their status to incite trust, thus a blockchain may be counterproductive in that it suggests that trust depends on outer review instead of notoriety (Zheng 2018) & (Kolvenbach 2018).

(Duan & Zhing & Kui 2017) conform to formative needs of time in the model of new financial matters which is portrayed by share economics. What's more, direct evaluation for learning results dependent on square chain record by the outsider, learn translation of result, and supply learning content for students which could arrive at graduate necessities and most appropriate to their inclinations and give driving importance to understudies' learning.

(Peter 2018) gives a perspective on more noteworthy manageability and 'future-proofinging' of educational programs colleges may pass judgment on it important to move accentuation from scholastic disciplines towards procedural information in real life, supporting delicate aptitudes and creating understudies as entire people with adjusted instructions, progressively coordinated and versatile for evolving conditions.

Challenges:

The potential drawback of blockchain in education remains unquestionable.

(Chen, Xu, &Lu 2018)As a complex system, there is a need for the subjective assessment by the instructor to review the learning behaviour and outcome of the students like essays and presentations made in the classrooms. These kind of subjective learning activites are difficult to be evaluated to a certain extent without human intervention using the pre-programmed smart contract.

The classic concept of Proof of Work consensus mechanism accounts a poor performance in terms of increase in number of transactions per second, with energy wastage (Vukoli, 2015), which costs more and become a hindrance for a blockchain application in the institutions.

(Chen, Xu & Lu 2018) & (Judd 2018) addresses the technical barrier- blockchain application in education encounters many technical barriers that are not addressed. (Grather 2018) proposed that the accreditation authority acts as a single powerful root node wherethe identity scheme is strictly hierarchical. The entire network is collapsed, if the accreditation authority's private key is compromised or lost.

Blockchain network is public with no single controller and distributed. (Judd 2018) the question arises on the feasibility of blockchain for systems of higher education is mainly because of the enormous amounts of time and energy required to create a block for data. It's like a puzzle, if even a single piece doesn't fit, it will be rejected.

By increasing day to day transaction, the blockchain becomes heavy and the propagation speed would slow down due to the large block size and lead to blockchain branches. Problem takes out the scalability of the network. (Zheng 2018).

It is a challenge to adopt and implement a globally decentralized, trusted, secure credit platform (Turkanovic 2018). The fact that leads to many of the obstacles is that students' academic records are sensitive and have complex management regulations in place. (Anascavage & Davis 2018) says that it is not easy for institutions of higher education to change, they argue that the move to blockchain will likely force them to find ways to stay relevant.

It is difficult to find the controller of the blockchain system, whether it belong to a university, or controlled by a group of Universities, or if a public blockchain such as the one in Ethereum is appropriate. Boundary defining process becomes tedious and unclear (Rooksby & Dimitroy 2017).

It is discussed in Meiklejohn et al. (2013) and Kosba et al. (2016) that blockchain cannot assure privacy of all the transactions as the values and balances for each public key are publicly visible (Zhen 2018). (Gilda & Mehrotra 2018) There will likely be important considerations around who ought to have transactions stored: while there exists cryptographic guarantees for privacy of the transaction when it is stored, there is always a risk of some data leakage (e.g. via usage, frequent updates, etc) that would worry some policy makers.

Due to the public access property of the Internet and the tamper ability of data, the effective maintenance of the students' intellectual property to some extent is not possible; the cross-platform course sharing mechanism is not that much mature to fully share the teaching resources. Maturity problem is mentions as a big issue in (Sun 2018).

(Zheng 2018) addresses that Blockchain is susceptible to attacks of colluding selfish miners, who mines their private chain before publication for profit intention and it affects the efficiency and performance of the blockchain technology.

(Rooksby & Dimitroy 2017) says that when developing and issuing a crypto currency, it need to be STRATEGIC, to take account the needs of the University. Mostly the benefit of the university will be considered, not just the student. Holding, the usability of 'local crypto currency' in the University gift shop is not that much possible in reality but within the local community may help the University in its society or community role.

Universities must poses efficiency to adopt blockchain technology if it can save resources. Indian universities also consider the Efficiency and cost reduction for their administrative decision making purpose. It is as mentioned by (Rooksby & Dimitroy 2017) that blockchain technology will not provide this.

Designing blockchain systems for application in existing contexts is a severe challenge because Blockchains something targets to impose new ways of doing things through an infrastructural ways that can challenge fundamental assumptions about what an organisation is and does.

C. What are the future implications with block chain for educational purposes?

Blockchain finds many innovative applications in education field more than just diploma management and achievements evaluation. For all the stake holders of the education system, there awaits a great potential for wider application portfolio on, learning activities, design and implementation, formative evaluation and continuous tracking of the whole learning processes using blockchain technology.

From the student's perspective, still there remain some negative signs for objective or subjective factors which cause poor learning outcomes, like the lack of motivation and financial pressure. Due to the peculiar currency property, Sharples and Domingue (2016) idea of "learning is earning" can be implemented to encourage the students. The present educational scenario can be integrated with the smart contract between students and teachers. Through some simple clicks or assignments the instructors can award students with a certain number of digital currencies using smart contract. Education wallet can be used to store such currency awards, used as tuition expenses, can be used with premises, and even exchanged with real currencies.

The current architecture of the Disciplinea platform in which an existing Educator should give acceptance to a new Educator to join the network and possible to provide ratings of a new Educator also determined by the existing Educators. However, there is a possibility of providing unfair ratings: for example, they could ignore the existence of private teachers, thus making their contributions less valuable, or purposefully lower the ratings of competitors entering the network. To avoid such problems we should carefully integrate the rating computation algorithm into our architecture.

To provide equal opportunities for both the private and large educational institutions, on-chain sources of information based rating can be given. Still, there remains many challenges to be solved to integrate the rating system into the architecture.

To create a trustable learning process and results system, there must be a distributed and trust worthy storage method for tracking the students learning process and also interface the student's data with the public ensuring data security and non-tamper ability.

Additional vulnerabilities of stress testing in field is also paramount. Fruitful results can be obtained if additional improvements are made to leverage Hyperledger Fabric to prevent these leakages. Thus, it can enable the interaction among the stakeholders such as educational institutions, employers, private trainers, students, teachers and external contractors leading to the wide-spread use of trustable e-certificates, online education, assessment, verification and data storage in an effective and efficient manner.

V. CONCLUSION

The blockchain technology being an independent and distributed system makes variety of implications on all fields, especially in education field the advancement of the blockchain technology is not in a developed stage. As per the authors' knowledge gained from this study including of 40 articles, the blockchain technology has made its entry in various aspects of education including the intellectual process of assessing the students' ability along with certification management which includes issue and verification of records, credit management, online course management, safe storage of learning data, and tracking the performance history of the students. The above said applications results in various benefits for the students to improve their standard of learning through various shared interaction cross-platforms, curriculum and teaching development and a interaction with the employers, as well as the institutions are benefited by reducing the administration cost, enhancing transparency which would generate the reputation, trust and efficiency. But still there are some challenges which should be considered at a highpoint like technical barriers, privacy, security, selfish mining, scalability be adopting. There is no one entity that owns the blockchain, a democratic system. The move to independence is contrary to the centralized autocratic educational institutions today where the advancement of the technology in education is lagging especially in developing countries like India. While some institutions are influenced by meritocracy, it will take a consortium of leadership to adopt a blockchain with full participation of all institutions. The potential remains unexploited.

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