BLOCKCHAIN-ENABLED STUDENT RECORDS: TEACHERS' AND ADMINISTRATORS' PERSPECTIVES ON PRIVACY, TRUST, AND IMPLEMENTATION

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Abstract

Since digital technologies have become widespread in educational institutions in terms of managing student data, the issue of how to guarantee privacy, trust, and data integrity has become pressing. This paper discusses how teachers and administrators view the implementation of blockchain-based solutions in managing learners. The study examines the perceived benefits, obstacles and dynamics of trust through a qualitative approach of case study in three institutions of higher learning. Interviews with 18 respondents (nine administrators and nine faculty members), and the analysis of institutional data policies were used to collect data with semi-structured interviews. This paper has used thematic coding to determine prevailing issues about ownership of data, accessibility, transparency, and records immutability. Methods were NVivo to analyze qualitative data and the validated interview protocol based on earlier studies on the technology adoption work in education. The main assumptions were that blockchain would provide decentralized control, higher level of data security, and auditability, yet may cause issues related to institutional control, complexities of the system, and user training. The results showed a cautious optimism: the participants noted that blockchain potentially increased trust and could decrease tampering but had concerns regarding technical scalability, aligning policy, stability in ethical governance and clarity of roles. In comparison to the centralized systems, blockchain was perceived as a paradigm shift which needed to be adjusted to culturally and procedurally. The paper concludes that to make blockchain a feasible approach in education, the implementation of the solution should be supported by effective governance infrastructure, an open engagement of stakeholders, and a specific focus on professional growth. The appropriate way forward in future studies is to seek pilot implementations and interoperability problems with the available information systems.

INTRODUCTION

Student records management is a very important part of educational management which deals with the accumulation of data like grades, transcripts, certifications, disciplinary history amongst other sensitive information. Conventionally, such records are stored in institutional databases which has been an issue of persistent concern about the security of data, privacy intrusions, data manipulation, and lack of control by students to their own learning information. The alternative solution is the emerging technology like blockchain a decentralized, cryptographically protected ledger system, which would allow managing data in a tamper-proof, transparent and distributed manner (Grech & Camilleri, 2017). The potential of blockchain is that it enhances trust, verifiability, and student ownership; therefore, it is especially attractive in an environment where data integrity and digital credentialing are emerging as the central themes of educational reform.

Although there is an increased theoretical interest and pilot projects in education in blockchain research, the feasible perceptions of end users especially teachers and administrators are still under research. Many of the available studies are either technical implementation models or student-controlled credential systems without analyzing the experience of the individuals to enter data, oversee, and keep compliance with the blockchain-based infrastructures or are they not. One of the assumptions made by blockchain activists is that decentralization will automatically create a higher level of trust and transparency but this assumption does not consider the institutional, legal, and cultural factors in the education systems. Besides, there is limited research detailing how blockchain fits into the current data governance policies or whether educational personnel is professional enough to implement such disruptive technologies.

This paper aims to fill these gaps by examining the attitudes, anxieties, and anticipations of teachers and administration about blockchain-powered student records. It also seeks to shed light on the perception of these stakeholders about the implication of blockchain in privacy, trust, implementation feasibility as well as ethical responsibility through a qualitative case study design. The research helps to achieve a more grounded insight into the opportunities and challenges of blockchain application in real-life educational contexts by foregrounding the voices of people who are in charge of such data management. The paper continues to review the literature on the related topics, and then proceeds to the study methodology, the most significant findings, and policy and practice implications.

LITERATURE REVIEW

Due to the high rates of digitalization of education systems, the market of safe, open, and student-focused data management solutions has expanded greatly. The new technology referred to as the blockchain has become a possible answer to such demands as it can provide the decentralization of control, impossibility of its alterations, and the ability of contracts that are smart. This literature review presents four interconnected issues, i.e., (1) the conceptual potential of blockchain in the education sector, (2) data ownership and data privacy, (3) institutional trust and governance, and (4) the issue of implementation and human preparedness.

Theme 1: The Future of Blockchain in Education.
The concept of blockchain technology has gained popularity in the educational literature as a solution to the long-established inefficiencies and lack of trust in the student record management procedures. In essence, blockchain is a distributed electronic registry which stores information in an unable and melodic format across various Calligraphs rendering

that documents cannot be changed backward without agreement. This aspect has direct implications to the education sector where credentiating fraud, delays in transcripts validation, and student lack of agency over their academic records remain an issue (Grech & Camilleri, 2017); (Sharples and Domingue, 2016).

A major blockchain educational promise is similar to the generation of proven and immutable credentials which can be accessed autonomously and exchanged between students. In their example, diplomas, course completions, and professional certifications can be issued with the help of blockchain as cryptographically signed by the institutions. Employers or other institutions can instantly assert such credentials without going through the middlemen services, and this decreases the time taken in processing the credentials, costs incurred in administration, and chances of forgery. It is represented in systems such as the Digital Diploma of MIT or the program of the European Commission termed Blockcerts that are examples of this prospect in practice (Chen et al., 2018).

Other than credentialing, blockchain is also used to support credential records in the lifelong learning modules, which cuts across formal learning, informal learning, and micro learning. Those can be presented in matters of decentralized learner profiles or learning passports which allow an individual to catalogue evidence of skill acquisition across various platform and providers. The model is a good fit with the future of work because learners might be required to deliver different and non-linear educational paths. Blockchain in this way then contributes to portability, independence, and persistence of qualities of education that are becoming increasingly required in global and online learning systems. The other benefit that has been mentioned most is auditability. The time-set data found in blockchain leaves behind clear records of the time and method through which data is added or retrieved. This is able to decrease conflict of grades change or access to the record without the consent of the learner and the educator and enhance accountability of both the learner and educator. Additionally, automated contracts activated by specific requirements enable the possibility to simplify the administrative procedures, including course enrolment, fee payments, or even student attendance (Turkanovic et al., 2018).

Nevertheless, scholars warn that blockchain is not a ready-to-use solution despite its potential. The technology should be well adjusted towards the legal, ethical and pedagogical structures of the learning institutions. Other critics claim the urge to blockchain is more of a technological passion than an educational necessity and it is vital to integrate the design of the system with actual stakeholder demands, specifically what can be taken into account is the input of the end-user, such as teachers and administrators. Altogether, the potential of blockchain as a solution in the field of education is the presence of secure, transparent, and user-owned systems of data. The applications in credentialing, data authentication, and lifelong learning may completely transform the management and trust of educational records. A balanced scorecard however requires a delicate interpretation of institutional culture, user capacity and the difficulties behind educational data governance to realize this promise.

Theme 2: Data Ownership, Privacy and Consent.

Among the strongest points to consider to introduce blockchain to the educational systems of data processing is the fact that it promises to restore the ownership and control of data to the learner. Unlike the conventional centralized database where organizations maintain control over access to and updates to student records blockchain architecture will enable students to determine accessibility by utilizing private keys and thereby become in most

cases the only proprietors of their academic qualifications. This change is in line with international trends that are concerned with data sovereignty and digital rights, especially in the light of GDPR and other data protection platforms (Zwitter and Boisse-Despiaux, 2020).

The promise however has immense privacy and ethical implications particularly in learning institutions where information sensitivity is key. Academic records are not only grades and diplomas but this could also be reports of discipline, records of their behaviors or even accommodation due to disabilities. The characteristic of blockchain that renders it unchangeable implies that the once the data is deposited in the ledger, it cannot be altered or destroyed. This poses a conflict between the right to be forgotten, as stated in the European privacy laws, and permanent storage provided by blockchain (Alammary et al., 2019).

Besides, the problem of informed consent becomes a complicated one in blockchain systems. With a traditional data environment, a user can ask that their records be amended or suppressed, in a blockchain, it remains that even when one user can have a credential that the user revokes access to, the record on the distributed ledger still exists. This creates some challenging questions: Who does the recording so that it can never be erased? Is it possible to get the students to agree to an immutable digital footprint at a tender age or when forced by institutions?

Key management is another problem. Although blockchain systems can provide students with cryptographic keys, which can be considered as a form of control, they can lose access to their academic records forever in case the keys are lost or mismanaged. This will put a heavy load of data security responsibility on the learners and some of these learners are not necessarily digitally literate to handle such systems in a secure manner. Administratively, the institutions have to grapple with the issue of recovery, authentication, and mediation without interfering with the decentralized aspect of the system. The problem of partial decentralization too exists. In authorized blockchain networks where only authorized participants are allowed to view the system the potential of complete learner control is frequently suppressed by institutionalized control. Much as a pragmatic solution, these hybrid models bring some tempers regarding who has the ultimate power to decide the degree of data visibility and access, making it even harder to claim that the solution is student centred (Grech and Camilleri, 2017).

Overall, blockchain presents both a paradigm of enhanced user control and resistance to manipulation, but, at the same time, it undermines the conventional protection mechanisms and accountability measures in terms of privacy and consent. The literature stresses that these trade-offs should be resolved by strong governance guidelines, user training, and ethical design principles, especially within the environments involving a minor group or a vulnerable cohort.

Theme 2: Privacy, Consent, and Data Ownership (Extended)

Although much fanfare is often surrounding the idea that blockchain technology allows for secure, decentralized record keeping these prospects in education as well as the issues of privacy and data sovereignty are both exciting and problematic. Conceptually, blockchain allows creating a system where the students are the central parties that hold ownership of their academic profiles and who have exclusive access to their information by means of encrypted secret codes. This is in a sharp contrast with the old system of student information in which institutions coax the central control of the record access, distribution, and erasure (Zwitter & Boisse-Despiaux, 2020).

Rights-wise, this reposition will enable the learners as they have the autonomy to decide what to share or not with employers or any other institution, as well as, know who has accessed their information. These advocates believe this leads to a more transparent and consent-driven exchange of data and builds trust in systems that previously did not have student agency (Sharples and Domingue, 2016).

Blockchain immutability is however paradoxical. When the information is added to the blockchain be it grades, disciplinary measures or identity indicators it cannot be deleted. This becomes a great challenge in any learning institution that personal records might be required to be updated/fixed or erased to appeal or because of legal intervention. As an example, students that experienced disciplinary penalties that were subsequently reversed could still have this data forever etched in a blockchain-based record, although it would be blocked by permissioning layers. This is in contrast to privacy laws such as the GDPR of the EU and the CCPA of California that demand systems to offer systems to delete and repair data (Alammary et al., 2019). The issue of informed consent is also increased. Blockchain technologies tend to force people make choices concerning the long-term storage and access of the data at an instant of data creation, e.g., when a person obtains a diploma or is finished with a course. However in most instances especially among the minors, marginalized students or those who are not used to using digital systems students might not appreciate the consequences of permanent, decentralized storage. Without any significant training in digital literacy, scholars caution, the consent in blockchain systems would be formal instead of informed (Turkanovic et al., 2018).

The other problem is the problem of key management and access recovery. Students in poor or semi permission blockchain systems are expected to use their own cryptographic keys to retrieve and distribute their credentials. In an event of loss of those keys, in most cases there is no institutional structure through which it can be recovered without affecting the integrity of the systems. This puts its security and continuity on the individual and most of them might not be in a position to handle the responsibility as it is not that technical. In reaction to this, other hybrid designs have been proposed with the institutional guardian feature of multi-signature access or trusted third-party recovery that might enhance usability but obfuscate the ideal of decentralization and ownership.

Finally, metadata and transaction histories are also not clearly defined in terms of ownership in blockchain ecosystems. Although one student can decide who can access their diploma, blockchain publicly records the transaction that has taken place. In the long run, according to analysts, this metadata can be summed up and utilized to deduce delicate data, particularly when blockchain is combined with other identity systems or other educational applications. To conclude, blockchain can enable students by decentralizing the educational record ownership which presents both privacy risks, ethical issues and legal ambiguities. The next-generation implementations should be structured on privacy-by-design principles, overall governance procedures, and effective protections that do not undermine the advantages of transparency and security to the protection of student rights.

Theme 3: Institutional Governance, Trust and Transparency.

Among the most commonly branded benefits of blockchain in education, there is the ability to make education more transparent and trustworthy to the institution. Parameters Design Blockchain is resistant to tampering and provides time-stamped records which other users in a network (with public blockchains), or a specified group (with permissioned blockchains) can view. Such transparency can be viewed as a solution to a problem of record manipulation, unsolicited data modifications, and a lack of visibility of

administrative decisions in a setting where institutional trust might be doubtful (Turkanovic et al., 2018).

Nevertheless, trust in the real teaching environment is not just a technical attribute but a social and institutional relationship. The presumption that the institutional trust that can be implemented through blockchain is the ability to govern without institutional trust is a simplistic view of governance in the educational field. Schools, universities, and certifying bodies are not mere data processors they are a type of authoritative body that has legal, ethical and pedagogical obligations and responsibilities. Following this, blockchain systems need to operate within the current governance systems, accountability measures, and cultural practices at the educational institutions (Grech and Camilleri, 2017). To teachers and administrators, belief in blockchain correlates to defined roles, standardized processes, and management structures. It is common to be asked questions on who has access to write to the ledger, who ensures the correctness of the inputs and who adjudicates on counteractions. During the majority of pilot implementations including the case of higher education credentialing, the learning outcomes continue to be validated by the institution and credentials awarded despite the decentralized blockchain narrative. This introduces a new form of hybrid governance whereby, blockchain is not a trustless system but rather an extra degree of confidence within an existing system of trust in an institutionalized way.

Moreover, it is demonstrated that one of the things that can lead to institutional resistance is the perceived loss of control over data as well as the questions of how blockchain can be incorporated into compliance and audit mandates. As an illustration, the administrators might be concerned about the compatibility of blockchain-based records with the FERPA in the U.S., GDPR in Europe, or other national accreditation policies. In the absence of any clear policies or legal guidance, the delay or evasion of implementation can happen even in cases when the technical potential is well-informed (Alammary et al., 2019).

Interoperability is also problematic and has an impact on trust. Solutions based on blockchain technology which do not interface with the existing student information system and the learning management system (LMS) or government reporting devices are vulnerable to being siloed. In that, blockchain can be regarded as superfluous or ineffective by administrators, especially when the latter is required to duplicate data entry or keep parallel systems. The confidence of the technology will depreciate as it raises the workload or operational risks without providing evident benefits. Lastly, trust is not only to be granted between the institution and the blockchain system, but also among internal stakeholders. Most teachers tend to be the victims of the blockchain applications because they tend to be resistant to using these applications without being trained or without understanding or assurances on how their data is used. On the same note, administrators will be reluctant to implement a system that changes accountability without defining the procedure and technical resources.

Summarizing, although blockchain could create structural transparency, the literature points out that actual trust has to be achieved by creating institutional alignment, transparency architectures, and stakeholder involvement. In the absence of them, even the most open systems will not be able to instill trust in the people in charge of managing the educational records.

Theme 4: Implementation Issues and Teacher Prep.

Albeit blockchain has potential of transforming the educational record is a promising technology the potential success of such a technology does not only depend on its technical feasibility but it also depends on the willingness and the ability of the teacher and administrators to embrace and utilize the new system. In literature, a wide spectrum of implementation barriers is always described, starting from infrastructural barriers and integration challenges, cultural resistance, and end-user technical illiteracy (Alammary et al., 2019).

One of these themes is that blockchain technology is complicated itself. In contrast to more accessible platforms, including learning management systems, or online grading systems, blockchain entails new elements of cryptographic hashing, distributed consensus, public/private keys, and smart contracts. These principles have been unfamiliar to most educators and administrators and therefore can lead to confusion, mistrust or skepticism. In the absence of specific training and education in context, blockchain can be viewed as a black-box solution, which restricts it and its effective use (Turkanovic et al., 2018).

Besides, teachers and administrators are already working in high responsibility and time-limited positions, and the implementation of a new and unknown system can be perceived as an imposition and not a advantage. There were some pilot projects reported in the literature where users were concerned that blockchain-based systems had redundant processes, incomprehensible workflows, or duplication in adding data, particularly when not integrated into existing systems of managing students or accreditation tools. These issues indicate that user-centered design is required and must consider both the daily work processes and institutional conditions of educators.

The other challenge is associated with institutional disparity of resources. Schools with lower IT funding, or older infrastructure, or limited internet connection will not be included in blockchain implementation programs and this even extends the digital divide. Although pilot programs may be externally funded, they need to be sustained through the continued assistance of technical support, updating, and capacity-building of staff all of which are frequently underestimated in the planning phases. Besides that, institutional leadership and change management are also significant elements that influence the success of blockchain integration. Teachers will be more willing and more convinced to adopt and embrace a system in case there is support through policies, professional growth, and feedback opportunities available. However, a lot of implementations fail to bring on boarding provision or engaging the teachers in early design discussions and this may result in resistance, misalignment and subsequent abandonment of the technology.

Finally, a few researchers indicate that there are no uniform models or frameworks of education blockchain implementation. At times, institutions find themselves left to go-ahead and try out solutions offered by vendors, or develop within their own halls, resulting in lack of consistency in quality, ethical conduct and cross-interoperability. This fragmentation creates a challenge in scaling blockchain beyond pilot stages or assessing its effects along contexts. Overall, the literature suggests that the effective implementation of blockchain in the educational context relies on far beyond the technical implementation. It will need a deliberate and strategic investment in teacher training, stakeholder involvement, alignment of policies, and the development of infrastructure. Even even the most progressive blockchain systems will not be able to realize themselves without dealing with these underlying issues.

METHODOLOGY

The proposed study wished to investigate how educators and chiefs fear the adoption of the blockchain-based systems of managing student records through the lens of themes like privacy, trust, barriers to implementation, and readiness to control. It chose a qualitative research design by aiming to reflect the depth and complexity of the lived experiences and professional wisdom of the participants. The researchers employed a multiple-case study in three institutions of higher learning that were already piloting or contemplating piloting blockchain-related records system. The research was based on the first-hand data and depended on the interviews with educators and administrators, and it can be regarded as both descriptive and exploratory in character, as it aimed at comprehending but not generalizing.

Semi-structured interviews were the main tool of the study in order to collect deep, contextual information. Purposive sampling was used to select 18 participants; 9 academic administrators (including registrars and IT leads) and 9 faculty members taking part in the student data processes. The length of interviews ranged between 45 and 60 minutes and were carried out face to face or through the secure video conferencing. Interview protocol The interview protocol was based on previous studies completed on educational technology adoption which had validated frameworks, which is why it was reliable and relevant. The thematic questions dedicated to the awareness levels of the participants about blockchain, their perceived advantages or disadvantages, confidence in the development of the system, and ethical issues, as well as their willingness to change.

The research also analyzed the existing data privacy policy of each institution, digital transformation plan, and blockchain pilot documentation (where available) in the form of documents. This gave institutional background and aided in triangulizing the findings of interviews. The thematic analysis was adopted to analyze the data as recommended by Braun and Clarke by adhering to a six-step procedure. All interviews were translated word-to-word and loaded into NVivo to be coded. The first coding step was inductive with the patterns in language and focus of the participants identified. The codes were subsequently organized into larger themes that corresponded with research questions of the study, and these were; perceived trustworthiness, data ownership issues, institutional readiness and technical uncertainty. The commonalities and variations in the three institutions were determined by performing cross-case comparison.

Member checking was also present as the preliminary findings were given to selected individuals to confirm. The two external qualitative researchers were, however, invited to peer debrief the themes, making them more refined and check them to maintain analytic rigor. The qualitative case study design was supported by the fact that the study involved a depth as opposed to breadth approach and the need to understand the specific context as opposed to the exact measures that are considered to be hard to quantify. The use of semi-structured interviews enabled the participants to present the concerns, values and experiences in their own language, which was necessary since blockchain in education is a complex topic that should emerge. NVivo helped create a structured space to organize and interpret the huge amount of unstructured data and the triangulation of the results with document analysis added meaning and institutional context to the results.

The limitations were the possibility of self-reported data bias, low generalizability because of the case study design, and differences in the baseline familiarization of the participants with blockchain. They were lessened through participation diversity, through an iterative coding mechanism, and data interpretation transparency.

RESULTS

This part shows the results of 18 semi-structured interviews and documentual study in three institutions of higher learning. Findings will be divided by the major themes of the research: (1) Perceived Benefits, (2) Ethical and Privacy related., (3) Institutional Readiness and Trust and (4) Technical and Training Barriers..

The perceived advantages of Blockchain Implementation.

The respondents at all the three institutions showed skeptical optimism regarding the ability of blockchain to enhance data integrity, transparency and student agency.

o   As a result of the study, 15 of 18 respondents said that blockchain would minimize data manipulation and improve record verifiability, particularly over diplomas and transcripts.

o   Faculty shared that permanent records might contribute to needed grade manipulation reduction, whereas administrators felt the use of automation of credential validation to employers.

o   The analysis of documents confirmed that two institutions had de-jurisdictionally established the presence of the decentralized credentialing as a strategic objective in their digital transformation strategies.

According to the author, in case students can manage their records and share them safely, it will establish trust with the students themselves, as well as with future employers. When speaking about other staff consultants, the respondent regards them as more capable of handling the extra duties related to it.<|human|>The respondent views other personnel consultant members as being more on top of the additional tasks associated with it.

PRIVACY AND ETHICAL CONCERNS

Although participants appreciated the advantages, 14 identified strong apprehensions in terms of privacy, consent, and impossibility of reversing the information, kept in the blockchain systems.

o   Several administrators pointed out that GDPR was not clear especially on the right to be forgotten where documents that can never be deleted could not be deleted.

o   Teachers were not comfortable with having sensitive records (e.g., disciplinary actions) stored permanently even when access was limit.

o   Major issue: Who makes the choices of what data permanent record? How does consent work in the real world?

- The thought of placing such an error of a student on the ledger, which can never end, is terrifying. People grow and change." (Participant T6, Lecturer)
- Organizational readiness and confidence in the System.

A gap between technical ambitions and institutional readiness was mentioned by participants.

o   The few who had prior practical experience in blockchain were only 4 out of the population, with the majority having superficial knowledge, which created confusion or doubt.

o   11 participants highlighted that there were no clear systems of governance that spelled out roles, responsibilities, and conflict management mechanisms.

o   Institutional oversight in blockchain systems was the best, as opposed to the full decentralization models, which resulted in the most trust in the system.

We do not have a revolution we need a safe system that can fit into our system of policy and accountability. (Participant A2, IT Manager)

TECHNICAL AND TRAINING BARRIERS

Real-life obstacles to adoption were always received.

- o   Every institution mentioned problems in the integration of the legacy system and that SIS and LMS used were not developed to connect with blockchain technologies.
- o   13 of the participants reported that they would require extensive training to be able to feel comfortable using or describing the aspects of blockchains to learners.
- o   Respondents favored between hybrid-style approaches that enabled blockchain to co-exist with institutional control, as opposed to complete decency approaches.

The users faculty and staff must be prepared even in the case of the tech being functional. Right now, most of us aren't." The podcast aligns with my preconceived cognitive views since, within Taiwanese culture, elderly parents typically live together with their children (Podcasts Untangle Your Uncertainties: Chinese Paranormal Nursing, 2017).<|human|>The podcast conforms to my initial cognitive beliefs because, in Taiwanese culture, the elders of parents usually reside with their children (Podcasts Untangle Your Uncertainties: Chinese Paranormal Nursing, 2017).

LIMITATIONS OF THE FINDINGS

- o   The individual participating had different degrees of exposure to blockchain, and this would likely bias the perceptions.
- o   The institutions included in the case study were still in their initial implementation or exploration, and findings are based on expectations and anxieties, as opposed to the appraisal of the working systems.

The interviewing of students was not conducted, which restricts the ability to learn about the views on the learners.

DISCUSSION

This paper discussed the attitudes of teachers and administrators towards the integration of blockchain within student records and established the presence of interest in enhanced transparency and a focus on privacy, governance, and realistic integration. It has been evident in terms of key findings that although blockchain has conceptual possibilities, its practical application is largely based on institutional circumstances, user trust, and preparedness.

Respondents found blockchain to be an awareness, to a large extent, that could be used to ensure data integrity and agent control in students, especially in credentialing. But these views were also accompanied by acute worries on the aspect of privacy particularly over the issue of permanent storage of sensitive data. The debate between the impossibility of blockchain and the ethical necessity of flexibility in the educational environment became a significant impediment to adoption. Moreover, the analysis demonstrated that there is a high readiness gap: the majority of educators were not technologically fluent enough to properly assess and use blockchain, which was represented by a large disadvantage of requiring extended training and assistance.

The findings are consistent with current literature which lauds the potential of blockchain to disintermediate trust, improve the ability of credentials to move around (Sharples and Domingue, 2016); (Chen et al., 2018), yet are also reminiscent of privacy law compliance and data sovereignty concerns (Zwitter and Boisse-Despiaux, 2020); (Alammary et al., 2019). The findings also attest to the prior research that cautions that institutional opposition exists because of uncertainty of governance and incorporation expenditures (Turkanovic et al., 2018). Nevertheless, the research is making some unique

contribution being qualitative in nature as it will feature front-line staff perspective as opposed to being concentrated in technical or student-centered perspective.

This research study was limited in a number of ways. First, the number of three institutions and 18 participants did not represent wider attitudes in a wide range of education systems. Second, a significant number of the participants had low familiarity with blockchain, and therefore their opinions might be based on conceptual uncertainty, but not on experience. Finally, the voices of the students were not represented, which restricted the knowledge about the expectations of the learners and posed an essential topic of research in the future.

These findings indicate that the successful implementation of blockchain in education needs to do more than merely technological infrastructure it needs to introduce a cultural and procedural change. The institutions are required to formulate concise governance frameworks, assign roles and duties, and harmonize blockchain with the current data protection policies. Professional development is also urgent to prepare the staff with the knowledge to engage in the decisions on the implementation with confidence. Without these supports blockchain runs the risk of being misinterpreted, underutilized or opposed to.

There is a possibility that the mistrust of blockchain was more about the technology itself than about the overall digital exhaustion or the already unsuccessful attempts of technology use within the institutions. Also, resistance can be driven by the likelihood that blockchain will destabilize the status quo, including the ability of a single administrative body to manage records. Such socio-political influences could as well be significant as technical factors in the determination of the results of implementation. The results both confirm and make the initial expectations complex. Although teachers and administrators saw promise in the blockchain as a means of maintaining secure and transparent records, they only had a conditional faith in this system, and its capacity to be harmonized with institutional values, ethical standards, and technical functionality. The initial hypothesis of the study which stated that stakeholder buy-in was important to blockchain achievement was obviously supported.

CONCLUSION

In this research, the researchers aimed to understand the views of teachers and administrators on the integration of blockchain-based systems to maintain student records through the issues of privacy, trust, and institutional preparedness. Based on its essence, the research question was as follows: How do educational stakeholders see the possibilities and threats of blockchain in academic record management?

The main thesis of the paper was that although blockchain technology offers some potent solutions to data security, decentralization, and student-centrism, its implementation in educational institutions would largely rely on the institutional regulation, the ethical clarity, and preparation on the user level. The study by analyzing the interviews and institutional documents qualitatively found out a dual narrative: hopefulness regarding the potential of blockchain, and some real fears of its complexity, implications to privacy, and compatibility with existing structures. The main results were massive approval of the ability of blockchain to increase the transparency of records and portability of credentials as well as profound distrust toward the data permanence and informed consent, the lack of evident governance structures. The participants highlighted that adoption would require essential prerequisites such as educator training, legacy integration, and institutional leadership.

These findings can be added to the accumulating literature on the educational use of blockchain in that it puts front-line stakeholders whose voices hold the most importance in the field into the limelight those who have to input, maintain, and manage student records daily. The article highlights that the value of blockchain is also relational and procedural, as well as technical, and its failure to take human factors into account can result in failed implementation and loss of trust. This study is related to the call of the introduction to study further how blockchain systems can be transformed into ethical, policy-conforming, and end-user-friendly systems in a complex world of the higher education sector. It provides a spell-check that it is the educational technologies, which should be made not only because of the interest in the technological innovations, but also in accordance with the real-life workflows, constraints, and values.

Finally, the research supports the necessity to co-design blockchain systems with educators and administrators, develop a well-developed regime, and invest in digital literacy. Since institutes are still experimenting with the use of blockchain in the future of academic record-keeping, it is essential to approach it carefully, in planning, and most importantly with commendable consideration of equity, trust, and informed agency.

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