

Blockchain Technology's Applications in the Educational Space

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Abstract

This research paper discusses the benefits and drawbacks of employing blockchain technology in the educational field. The digitisation and decentralisation of educational credentials, augmentation, and the encouragement of lifelong learning are the key applications of blockchain in education that have been suggested. Some of the key issues considered relate to data protection laws like the General Data Protection Regulation, which provide challenges for application developers and privacy issues. Scalability arises due to slow blockchain transactions and the problem of scalability. In addition, the challenges of market adoption and innovation highlight that blockchain in education is a relatively fledgling innovation that the governing bodies of educational institutions often ignore or consider in a cautious way.

Keywords: Self-sovereign Identity (SSI), blockchain, education, degree certificate, cryptography, authentication.

INTRODUCTION

Blockchain is one of the rising technology in new instances with features along with reliance, lucidity, abiding, impartial and etymology that gives specific answers to extraordinary issues in distinct industries. certainly one of them is truly additionally the education industry. There are quite a few steps and complex procedures within the schooling device (and mainly in higher education) that may be digitized. one in every of them is the method of issuing SSI or tiers to college students or displaying them to a third-birthday celebration institution.in the in the meantime it takes an endless time and electricity to get all the needed papers to prove that a pupil's attainment is original. The maximum commonplace events, which every pupil can envisage are doing an change consultation abroad and displaying one's accomplishment to an organisation. In our instance the companion college wants to have all possible papers regarding SSI and publications that an applicant has taken to be able to be capable of take a decision regarding accepting or declining an application. Or if one desires to keep on with their examine overseas, they need to demonstrate their achievements earlier. so as to do that, college students are required to touch their home university and ask to offer such files. In a whole lot of instances this takes some time and expenses in contemplation. [1]

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The second simple case is proving to an employer that the ascendancy is original. If so, the agency might want to contact the home college to ask even if the issued certificate is authentic and whether or not a scholar has taken the publications he pronounces to have.

This paper endeavours to reveal some danger to remedy such troubles via blockchain. This paper does now not move into tough info of building the suitable blockchain, but instead be after

theoretically conceptualizing the goals, which can be utilized by various universities, college students and employers to manipulate SSI and diploma certificates. this indicates a platform, thru which the university could difficulty SSI to college students as tokens after correctly passing an examination and consequently a degree certificates once you have the wanted quantity of credit/tokens. students might be in a position to be seen their accomplishment to their capable employers or to some other university through displaying their public key.[2]

EASE OF USE

The course in which Blockchain may be utilized by higher training establishments, as from an study recognized, are award of qualifications, licensing and accreditation, control of student data, intellectual assets manipulate and payments.three This paper locations emphasis on of these fields, particularly at the coping with of scholar information and the award of qualifications.[3] The probability of permanently annexing certificates in blockchains will also be extra distantly considered together with the possibility of the usage of substantiate sovereign identities for student identification within academic management.[4] the ones fields, in which the blockchain technology can offer some revolutionary solutions together with the reasons for executing blockchain-based solutions to be extant situations might be mentioned in the following factors of this financial ruin. One element is comprehensible, those new answers need to provide some issue finer for all the included events, otherwise it wouldn't bring together any feel to use them. that during mind, they want to be to start with reliable and complete of integrity, they have to be understandable sufficient for everybody to understand and adaptable.[5] among various things the ones solutions should shop the fee of handling and one of a kind problems that come together. all of the manoeuvres must take much less time to get completed and have to cause of completing their duties, now not feasible to fail and a very excessive distinction to refine information protection of the related parties. final however not least, maximum of those modifications ought to be absolutely legitimate.

Figure 1 Retaining scholar IDs. most of the people of better education establishments hold information of students' finished courses in extraordinary codecs. those databases are designed with minimal to no interoperability for body of workers individuals' most effective get right of entry to in devoted on-line structures. additionally, maximum colleges have their own unique device for keeping students' completed course records, which protects the database's non-public facts shape. In evaluation, blockchain records are saved permanently, regardless of whether a person has access to an institution's file-retaining system, so files like levels and path certificate may be safeguarded and checked (see discern 1). The certificates may want to nonetheless be checked in opposition to the data kept in a blockchain although the organization that issued them closed or if the whole academic system failed. Additionally, as certificates may validate themselves at the blockchain after being granted by institutions, no additional labour is required to demonstrate their legitimacy to other parties. Digital certificates are registered on the Bitcoin blockchain, cryptographically signed, and tamper-evident.

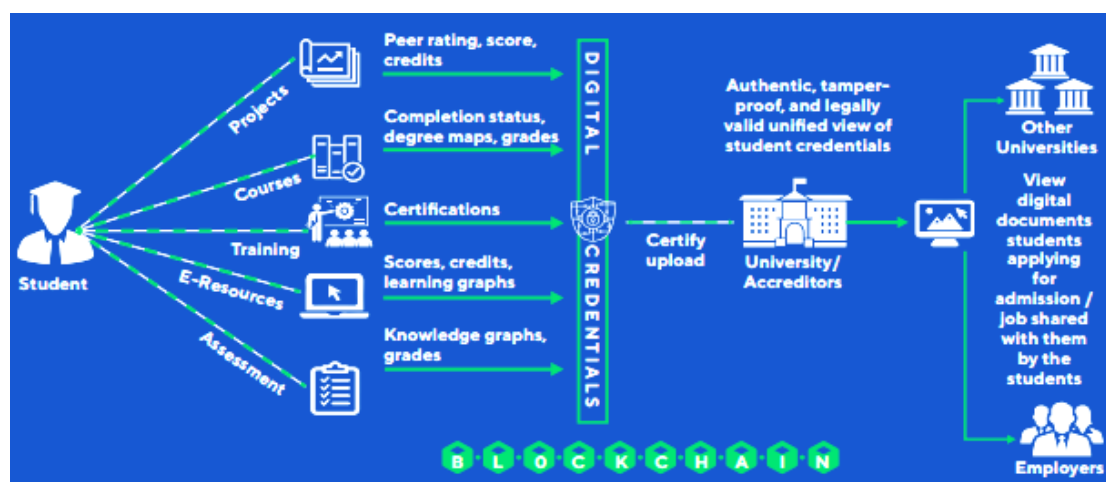


Figure 1. Block chain.

Every other ongoing difficulty for instructional institutions is identification verification, which necessitates plenty of manual paintings and gives numerous capability for records manipulation. The verification of a pupil's identity handiest takes location once throughout a digital procedure. The blockchain network holds facts about the scholar identity paper as opposed to the actual file itself. Students and process applicants can apprehend themselves on-line using blockchain while retaining manipulate over the organization and conservation of their private data.[6]

In large institutions, college students should often introduce themselves to numerous departments of the employer. In these conditions, either each element of the organization gathers its personal pupil records or unmarried signal-on is hired, allowing all events to access a unmarried shared replica of the scholar records.[7]

Dozens, if not masses, of these fashions percent of folks that may additionally have get admission to to a student's non-public statistics . To preserve this information safe, manage get right of entry to rights for some of these humans, make certain your device is likewise protected. A giant challenge, if no longer impossible. handiest a pick out few exist on the blockchain. Any celebration responsible for verifying the scholar's identity has get right of entry to to the information. The rest is as much as the scholar. because of this your business enterprise now not has to manipulate it.[8]

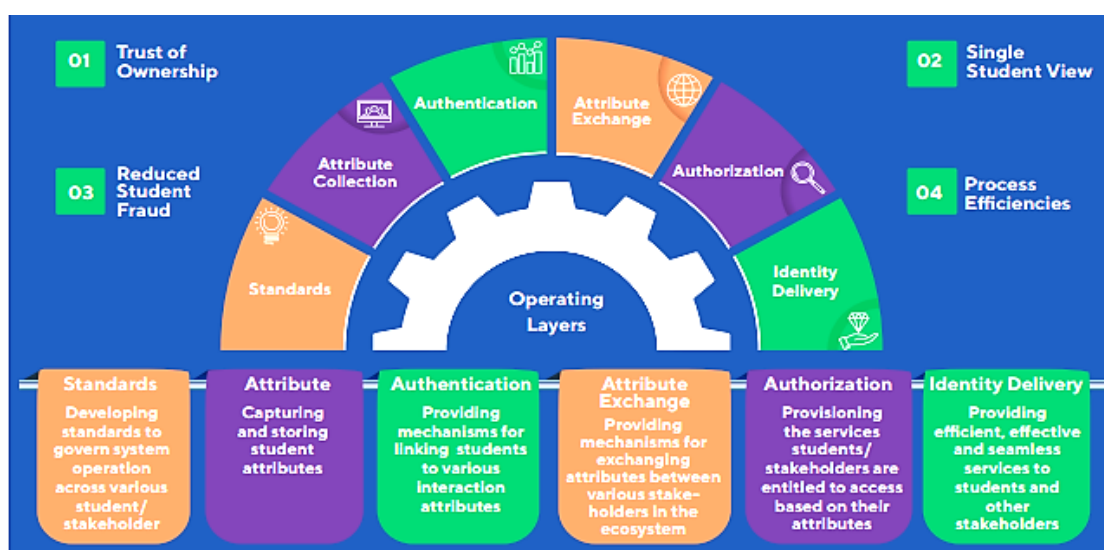


Figure 2. Operating layers.

User-centric identity control, which had wants, was the ancestor of the concept of self-sovereign identity. The user should be the primary actor in the identity management technique, to start. Figure .2 The consumer need to have manipulate over her records. This entailed that the consumer can view, modify, and delete in addition to provide and revoke get admission to to her non-public statistics. In order to avoid having to generate a new identity for each carrier, the user should be able to reuse their identity across a variety of services. For this purpose, quite a number protocols and requirements were created, which had been intended to facilitate information sharing and consequently identity reuse. These protocols include OpenID, OpenID 2.zero, OpenID connect, OAuth, and FIDO as examples. The consumer-centric identification idea aimed even higher: to present users the full and handiest control over and get admission to to their information. However, this objective was not entirely achieved because the organisations who registered the identities continued to own them.[9] Various negative effects resulted from this: The registration entities maintained full access to the consumer's private information., rendering the user's privateness void. Registering entities not often supplied migration offerings for their users' facts. This restricted the customers' capacity to freely pick their identity provider seeing that migrating from one to every other could be time-consuming and expensive. seeing

that registering entities retained possession over user-centric identities, that they had the power to delete these identities without The idea of Self-sovereign identification (SSI) became created to deal with these drawbacks and supposed to put lower back the user-centric identity theory. With SSI, the user has complete control over her identification. The user must be the most powerful authority with the ability to create, modify, or remove an identity The identity should be interoperable across more than one services as well as portable to any identification company that the person chooses. The consumer must have the simplest get entry to to the statistics and might supply get admission to to all or subsets of the personal statistics. These ten core notions may be merged into three greater degree standards, controllability, portability, and safety, and are detailed in a list of ten ideas. Higher levels of controllability, portability, and protection can be provided by SSI solutions using the blockchain than by SSI solutions not using the blockchain by means of storing the non-public information on a disbursed ledger instead of a centralized database, these SSI answers overcome the drawbacks of centralized PDSs by means of removing their personal facts get entry to and by using facilitating company switching for the reason that facts is stored publicly reachable . Numerous blockchain-based identification efforts have been published since the dawn of the blockchain age. organizations like Civic and uPort, simply to name some, promise to provide a decentralized and self-sovereign identification to the Businesses like Civic and uPort will be referred to as a Decentralised Non-Public Data Service (dPDS) in the following the important thing distinction of dPDS to SSI solutions with out blockchain is that users are genuinely in complete manipulate over their private records . By utilising the private-public key infrastructure that blockchains are founded upon, this is made possible. Accounts on the blockchain typically consist of private-public key pairs, with the general public key acting as the blockchain's identifier.[10] The public key on a blockchain with smart settlement capabilities, like Ethereum, can be used to gather and reveal personal data. The documents that were released to the general public key were then entirely under the total control of the owner of the private key to the public secret nobody with out the non-public key, no longer even the dPDSs, can re-sell, get admission to or do away with the private information. dPDSs use clever Contracts to store the private information in an encrypted or hashed shape at the blockchain

PROBLEM STATEMENT

Given that this technology is new and there aren't many use cases to draw from, a widespread use of blockchain technologies in education will undoubtedly raise a variety of issues and problems. The majority of the projects are still in the pilot stage and have not yet demonstrated their sustainability. As Bartolomé points out, it would be absurd to anticipate that blockchain technology will be used in education right now or that the modifications will be made in the near future He even asks the question of what the ideology and the agenda of institutions and enterprises trying to apply blockchain in education is.²⁶ Most of the criticism to the Due to its decentralised structure and absence of institutional regulation, blockchain technology is being used in education Despite that, Watters mentions also the invocation of trust mediated by technology as a big problem, since it represents a key social behavior. Other criticism comes from the idea that blockchain is supposed to be used only by the cryptocurrencies and in this way its implementation will make also education based on transactions, which would mercenary the industry even more. Another reason for sceptics of this technology to be sceptical about it is the fact that it is still in the experimental stage. Concerning issues include privacy and the use of technology to mediate traditionally social tasks.

CHALLENGES

There are critical specialised constraints for the relinquishment of blockchain era in schooling. a first and perhaps the most grueling bone is the proof- of- paintings, this is, the settlement medium for the verification of latest blocks (see the preface phase). The cost and difficulty of a blockchain's proof-of-work (mining) increases with its scale, making it more expensive. the dimensions and intensity of mining is virtually mind boggling, for case, Bitcoin miners cipher about 450 thousand trillion effects in keeping with second at a total cost in power, ministry and conservation hard work of approximately USD 600 million back in 2015 because of its hyperactive- intake of power, blockchain mining poses

challenges to the weather alternate and China has come the first nation to prohibit in all collectively. Mining a international blockchain in education will face the challenge of superior carbon footmark and “the solving of complicated nice issues as part of the affirmation process with out which fraudulent blocks may be delivered to the chain. So the transposition of mining into the surroundings of the Blockchain getting to know will endure special attention”

The trouble would not quit with the gratifying of the proof- of- work of miners. An training blockchain with pupils as Bumps, the due possessors in their separate blocks, has fresh challenges of qualia, this is, the ones elements of literacy that repel quantification

If a student have been to provide any such (mining) services in go back for a determine – style might the Blockchain manage the method.the technological mechanics of inviting participation, dispensing checks, amassing outcomes and allocating fees.

A blockchain that is constructed, used, and booby-trapped only within a single educational organisation or small institute is likely to be sustainably run a larger schooling blockchain at the public or international function, nonetheless, might be a meaningless design because it's usually probably to fail to change statistics in a decentralized community without having to undergo numerous third events. For instance, university degrees are nearly usually granted by the nation or university, that are 1/3 parties in a blockchain with scholar- Bumps. likewise, Watters refocused out a abecedarian nebulosity of an training blockchain in which institutions are Bumps — agree with conversations approximately ‘ consider ’ and the blockchain in education frequently body scholars(and/ as implicit employees) as being untrustworthy – as mendacity about their stages or their chops The blockchain might purportedly corroborate the ones credentials. however it's worth asking too if establishments are cozy. Which scholars, which establishments are and are not relied on? Why? through whom? what is definitely the source of ‘ accept as true with ’ in our present day credentialing gadget?. How would the accountability of institutions issuing blockchain-based credentials be assessed or supported? An training blockchain could produce a countless file wherein a selected information cannot be changed or eliminated, this is, it remains rigid and incommutable to all Bumps concerned. it's been wondered, nonetheless, whether or not that is actually perfect for scholars themselves or, whether a limitless report goes towards the introductory precept of schooling for increase, metamorphosis and if now not certainly redeeming reinventing oneself with a alternate or 1/3 risk

GLOBAL INITIATIVE

With the arise of e-Estonia and Bitnation governance, virtual international locations are giving rise to without borders education. not confined to any unique state- state or instructional institution, blockchain will allow premier literacy institutions to simply accept and contain classes, credit, and grades worldwide without regulations of country- international locations and governments changing inside the blockchain space is how those varieties of facts, or empirical claims, are being integrated into norms. The International Organisation for Standardisation (ISO) established a particular charge to broaden blockchain standards in 2016.⁹² despite the fact that training is missing, training records norms are demanded for the following organising settlement on harmonious language icing interoperability among a couple of executions Addressing security, sequestration, and records governance concerns

- Fostering believe, along with managing stop- stoner identification
- Easing perpetration of provenance tracking⁹³

Within the global huge net Consortium (W3C), the empirical claims working organization expresses, exchanges, and makes “vindicating claims less difficult and similarly at ease on the web.” Its responsibility “makes a speciality of schooling. The empirical claims mission force is a “neutral institution to bandy use cases (similar as registration) and the trouble region in fashionable. The organization is establishing and assaying establishments raised in colourful fora across the value- add that W3C could give to empirical claims which can be stoner- centric.”

CONCLUSION

This report has once again demonstrated the need for further digitalization in the higher education sector. The numerous existing options are considerably more than the ones that are suggested in this study. However, as can be seen, the majority of the proposed solutions only address a portion of the issue and do not approach the entire procedure as a whole. In my view, a solution that combines the concepts of the various "part-solutions" already in existence or even some fresh concepts may truly bring about a revolution in the digitalization of higher education. The advancement of society and the formulation of long-term plans should be facilitated by higher education. In addition, almost everyone would agree that there would be more digitalization in the future rather than less. And almost everyone would agree that there will be more digitization in the future rather than less, so the higher education sector needs to prepare for this by teaching as well as by doing. Blockchain technology provides practical answers to various issues in several industries. High potential player among them is higher education.

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