# Using Blockchain to resolve Database Distribution and Security Issues in The Learning Management Systems (LMS)

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**Abstract**
This research paper aims to shed light on the database distribution and security issues in the learning management system. It presents the basic principles behind the practices and legislation to determine their provision and limitation for privacy and security, which are more stringent security measures to be considered by a distributed database system concerning a centralized system in the learning management system. The researcher focused on monitored passive eavesdroppers, and the private information was held by the passive eavesdroppers, whereas active attackers predicted the messages along with the corrupt data, which are monitored either by inserting new data or modifying the existing data. In this research paper, the researcher tries to identify some of the significant security issues such as authentication and authorization, data encryption, internal and external distributed database approach and validated input in the learning management systems. The researcher optimized the security barriers on distribution databases using blockchain technology, which plays one of the significant roles in The learning management systems. For the strong and higher level of security concerned in the learning management system, the researcher used blockchain technology to provide secure and consistent data in the decentralized system in the learning management systems (LMS).

***Key words:***
*LMS, blockchain technology*

## 1. Introduction

The researcher emphasized that learning management is a key component in an integrated and effective talent management solution concerning distributed database security in the learning management systems (LMS). This provides continuous learning opportunities that improve workforce competency through the delivery and tracking of learning events, such as web-based training, traditional classroom activities, and other formal and informal learning activities. In this research paper, the researcher discussed the workforce required to adapt and learn in a competitive and dynamic environment [1].
Effective learning management facilitates communication between business pioneers and laborers, gives a clear course on structure objectives, supports current specialist improvement and joint effort, connects with laborers in their vocations, and drive structure execution to larger amounts though a decrease in task costs [1][2].
Information security, as applied to computers and networks, cover every one of the procedures and systems; through that, PC based instrumentality, information, and administrations are ensured against causeless or unapproved access, change, or pulverization. Workstation's security conjointly incorporates assurance from impromptu occasions and cataclysmic events [3]. Also, inside the business, the term security – or the expression PC security – alludes to procedures for ensuring that information hangs on in a workstation and can't be filtered or undermined by any individual while not approved. Most PC safety efforts include encoding and mystery. Encoding is the interpretation of data into a code that is incomprehensible without a disentangling means. A mystery might be a mystery word state that offers client access to a particular program or framework [4].
A distributed information may be information passed when not all storage devices are hooked up to a standard processor. As opposed to parallel frameworks, amid which the processors are firmly coupled and speak to one data framework, an appropriate data framework comprises of specific coupled locales that share no physical parts [5]. Framework chiefs will circulate the accumulations of data over different physical areas. A disseminated data will dwell on composed system servers or decentralized independent PCs on the web, on the organization's intranets or extranets, or elective association systems [6]. Because of circulated knowledgebase store information over numerous PCs, appropriate databases could improve execution at end-client worksites by allowing changes on a few machines, as opposed to being limited [7].

## 2. Background of The Research Study

Hassan Faisal Aldheleai et al., [2017] emphasized that cloud computing, as a new inspiration for a creative learning environment, offers the learner a new lacuna to help overcome hardware and software challenges. It tends to administer transient interdiction to cloud computing and cloud-based LMS, with some samples of some fumes

Manuscript received November 5, 2019
Manuscript revised November 20, 2019

platforms victimization to this technology. Additionally, we tend to summarize the foremost advantages and drawbacks of victimization of this technology to serve learners in this age of online learning [1].

Vahe A. Arakelyan [2013], on the safety mechanisms of the LMS Moodle area unit, investigated, wrote that some vulnerable components square measure was discovered and a number of solutions, along with the ways that the area unit projected to form the system are safe. The fast-paced progress in information technology permits the utilization of computers as an effective teaching tool. Automation of the methodology is accomplished, which implies that computer coaching programs and the utilization of electronic textbooks are the area unit used not only for magnetic storage medium media but in addition to native and world computer networks. The utilization of worldwide networks creates a specialized information-educational field that allows us to know about employment victimization trendy technologies. How to implement it in the informational tutorial sphere. Moreover, as in native and world computer networks, the effective use of e-learning materials, high-operative development area unit are essential and necessary [2].

Adrian Besimi et al., [2009] focused on regular security issues once, making a substitution framework different from fundamental program confirmation to physical access to servers. The assurance point of view in e-learning frameworks is normally disregarded, and this is why this paper will, in general, focus on basic security issues while growing new data systems. The researcher will, in general, present a three stratified security live, for example, the physical administration layer, the bundle board layer, and the social building business. The learning management system's three layers of security are presented in this paper and are utilized as a model towards the advancement of tantamount troublesome frameworks on the domain of adapting, in addition to comparable data frameworks on totally unique regions. The security issues tended to here are a unit normal once growing new data systems. The achievement of E-Systems will rely on assurance because of the number of clients in enormous associations. The occasion of system interruption, social designing, and hacking will perpetually be a blessing. Thus the sole issue is to fix the assurance, not only by bundle and equipment arrangements but by presenting extra measures, as physical security or "standardized savings" [3].

Doğancan Ülker and Yücel Yılmaz [2016] on information and communication technologies at different spheres of learning activities, wrote that, with these technologies, at some time, the barrier against the academic activities largely disappear and these technologies find it easier to carry out these activities further effectively. They keep a good deal of queries regarding the selection of the learning management systems to be used for the management of e-learning processes by all organizations conducting tutorial practices such as universities, companies, non-profit organizations, etc. The foremost queries area unit is as follows: do we tend to want open provision LMS or industrial LMS? Can the chosen LMS meet existing needs and future potential plans for the organization? What area unit are the probabilities of technical support at intervals of the management of LMS? What problems may pop up at intervals in the utilization of LMS and also by which means can these problems be solved? What effective amount can officers, at intervals, at the organization put in in the management of LMS? [4].

Panayiotis jock and defender Pappas [2016] proposed a learning management system (LMS) that measures the foremost vehicle for delivering and managing e-learning courses in a tutorial, business, governmental, and line learning settings. Ever since the nineties, there has been more interaction with LMS at intervals in the market, with an enormous array of choices. The increasing quality of these platforms makes LMS analysis troublesome and laborious to utilize a methodology that desires a good deal of information, time, and effort. Nearly five hundredth of respondents in recent surveys have indicated they request to alter their existing LMS primarily due to user experience issues. But the overwhelming majority of the living literature focuses exclusively on LMS capabilities in connecting administration and management of teaching and learning processes [5].

Khaleel Mershad Wakim [2018] on The learning management systems (LMS): as with a few current examination fields focusing on fluctuating innovations identified with the LMS, the long run ensures numerous adjustments in its structure, tasks, and usage. The preeminent essential innovation that is relied on to redesign numerous future perspectives is the Internet of Things (IoT). The researcher will, in general, blueprint a few components of the LMS, which can be tormented by IoT, thus the normal upgrades and changes that IoT will bring around the LMS functionalities [6].

Amir Khanpour and Monaliz [2011] on The learning management systems as a Web-Based business (WBT) among colleges and institutions: The paper recognizes the advantages and constraints of the chief learning approaches used in higher instructional exercise foundations, for example, synchronous and non-concurrent learning explores the PC code and PC document LMS used inside of the Cypriot colleges and contrasts their decisions and respects to understudies' inclinations for a helpful E-Learning surrounding [7].

M.S. Saleem Basha and P. Dhavachelvan [2010] on E-learning that satisfies the thirst of data for the student at any area, time and age though contrasted and traditional learning framework: This paper intends to create the web administration-based secure e-learning, the board framework to adapt to the issues and difficulties of the

customary E-the learning management system, EWeMS region unit are unrivaled as far as accommodation, deft, reusability, autonomy, adjustment, and collaboration. EWeMS gives partner environments to the executives and e-learning system. EWeMS focuses around the accompanying center decision's explicit Protection, Management, Learning Management, Delivery of the executives, Examination of the executives, Access of the executives, Audit, Event Notification, Partner Collaboration and so on., and truly focuses on incorporated stage keep with rising wishes of e-learning and management[8].

Najwa Hayaati Mohd Alwi and Ip-Shing Fan [2010] emphasized that the e-learning foundation's territory unit is racing into receiving ICT while not meticulously jumping up and seeing any associated security issues. E-learning is likewise a substitution system of discovery that relies on the internet in its execution. In addition to data security, the board is generally advised to add setting up a verified e-learning environment. E-learning is expanding at a horrendously quick pace. The advantages it offers increases the number of e-learning clients. The handiness of e-learning keeps on growing and depending further on the internet. The trustworthiness of data and materials among learning situations needs those countermeasures. Similar to security innovation equipment and bundle, they should be authorized [9].

Per Rhine Hansen [2018] referenced the term "security." It is misleading. Consequently, such a component does not exist, all things considered! Our point is to actuate security to some degree, yet will, in general, mastermind to protect ourselves and our IT assets against the usual dangers. In this way, in each individual and the overall population division, a high administration ought to be applied to a nearby bundle on dangers and vulnerabilities identified with the frameworks. Truth be told, acknowledgment is a tiny bit increasing, at a time, on the requirement for partner IT-security Management [10].

Bandara, F.Ioras and K. Maher [2014] on digital security that the group of principles set up for the insurance of this system: The expanding utilization of e-Learning frameworks has been reported by shifted studies and shows progress with development; practically zero consideration has been given to the matter of security of e-Learning frameworks in each analysis and training. The researcher, for instance, found a way to deal with comprehension, assessing, observing, estimating, and overseeing digital security because it identifies with e-Learning frameworks. Security of e-Learning frameworks speaks to a particular test as a fluctuated frameworks zone unit needs to through the internet by a great many more clients, rather than a few systems. In addition, a lack of the right IT arrangement and method in e-Learning frameworks is a light-weight of their customary style and their particular security needs [11].

Kavya G. S et al., [2017] emphasized that M-Learning has misrepresented the e-learning by employing the scholarly strategy student-centered. Notwithstanding, actualizing examination security in open situations where every understudy has his/her very own versatile/tablet gadget associated with a Wi-Fi arrangement. It's additionally associated with the internet as one of the first troublesome assignments. In such conditions, understudies can simply trade data over the system all through examination time. It's expected to coordinate the accompanying secure examination framework with existing partners, openly given and widely acknowledged The learning management system and its administration expansion to the them-learning environment, explicitly "Moodbile Project" [12].

Christopher Schultz [2012] on data security patterns and practices in e-learning says it's rare. The essential data security ideas to e-learning and rundown pose potential dangers or propose structures for arranging dangers. The point of this analysis is to distinguish, reason, and comprehend patterns and issues in data security in e-learning as reflected at interims on the discourses on a 'Security and Privacy' exchange discussion of the Moodle learning of the executives' framework. This analysis should bear some significance with instructors in data frameworks and the board on a few dimensions. First of all, as clients and sometimes specially appointed executives of learning the board frameworks, the subjects, and patterns recognized need to expand the familiarity with normal security issues at interims on the platform[13].

David A. Back et al., [2016] stressed that investigate medical students´utilization is their expectations on future developments. Methods: A single-center on-line survey has been administered to analyze medical students' (n = 505) usage and perception of the academic management system sheet, and the provided e-learning tools. Data was collected consistently, which consists of seventy things, and it was analyzed in quantitative and qualitative ways. It's desired that a learning management system support associate economical learning. The interactivity of tools and their abstract integration into face-to-face teaching area unit is necessary for school children. The academic management system was significantly necessary for structure functions and the availability of learning materials [14].

Sebastian's [2018] consideration of security and protection issues in E-learning goes thus: the analysis has been directly related to our undertaken that centers on interest understudies' exercises on Computer-Mediated Communication devices (for example discourse gathering, blog, wiki, and so on.). The analysis covered the examination of some current information on security in E-learning and client security insurance arrangements [15].

Ryan D. Rucker and geological area R. Frass [2017] focused on Desire2Learn (D2L) among a multi-university

framework. Employees' observations from a couple of the frameworks' schools were assessed utilizing a sort bolstered Davis' innovation acknowledgment demonstration. Scientists investigated reactions for varieties in the framework used experience and personnel utilization of business and bolstered administrations, with the utilization of D2L and gave the impression to utilize less work and bolster assets all through the movement [16].

Walid Qassim Qwaider [2017] focused on the scholarly surroundings having, as of late, experienced a quantum leap because of an increase in data innovation. This advancement has permitted the e-learning surroundings to use the preferred standpoint of electronic devices to fortify LCMS. The rise of the various e-learning organizations has quickened the reception of data and correspondence innovation though not taking due consideration and comprehension of security issues. LCMS is additionally a substitution learning technique that eventually relies on the web in its usage. The learning management system faces numerous difficulties as we tend to attend to referencing before occasionally attending to the usage of devices and projects, eminently the matter of security and wellbeing information [17].

Adrian Besimi et al., [2009] underlined that the regular security issues after making a substitution framework change from essential program confirmation to physical access to servers. The insurance viewpoint in e-learning frameworks is regularly ignored, and this is why this paper will, in general, pressure normal security issues with increasing new data Systems. The analyst will, in general, present a three-way stratified security system, for example, the physical administration layer, the bundle of the board layer, and the social building business. These three layers tend to change ways to verify clients' qualifications and totally unique information at interims in the newly made The learning management system 18].

Sheo Kumar and Kamlesh Dutta's [2011] focus on E-learning gives the likelihood to understudy and move electronically with one another, just like their teachers. This cooperation is through email, on dialog boards, or in visit rooms. As perceiving the world at large will continue to utilize language and word in various ways, so will the term virtual learning situations (VLE) be utilized to go to the on-line collaborations of a spread of sorts that occur among understudies and speakers. There are units of frameworks offered that supports VLE frameworks. This bundle is in each structure, mechanical, and open give bundle (OSS). Moodle is one of the frameworks that has been rapidly increasing in overall quality in the e-learning framework. LMS Moodle has lavish defenselessness like validation, accessibility, classification, and trustworthiness assaults [17] [18].

Luminita [2011] wrote that security could be a significant issue at interims at the specific instructional exercise setting where e-learning can increment in quality and additional society's region unit taking on-line courses. There are unit numerous fundamental components that must be considered: validation, getting to the executives, information respectability, security, and so on. Data security is being exploited in ways like cryptography and system conventions [16] [17].

Erinç Karata [2018] concentrated on customary instructive comprehension; people opt for graduate or post-graduate training if they so desire, after finishing their schooling, from kindergarten to secondary school. Today, by escaping this generalization, each proficient individual can pick diverse learning situations. Presently, learning any subject is at the tip of the fingers of a person without relying on a school with four dividers or in a certain period. In this examination, it is important to confirm the advanced authentications given to the members at the Turkish phase of the International Informatics and Computational Thinking occasion by utilizing the Ethereum Blockchain-based contract. The errands on occasion were transmitted to the understudies in Turkey using a test module of the Moodle The learning management system. For this investigation, a brilliant initial contract was created in which the declaration data could be put away on the Ethereum blockchain and could be checked for control purposes if necessary. At that point, the declaration module created by the analyst in 2014, which used square structure in the Moodle. The learning management system was refreshed and afterward furnished to work as per the savvy contract in the Ethereum blockchain [19].

Seyednima Kheer, Md. Moniruzzaman [2019] underlined that one of the most significant revelations and inventive improvements that is assuming an essential job in the expert present reality is blockchain innovation. Blockchain innovation moves toward diligent upheaval and change. It is a chain of hinders that spreads data and keeps up trust between people regardless of how far they are. Over the most recent few years, the upsurge in blockchain innovation has obliged researchers and masters to examine better approaches to apply blockchain innovation with a wide scope of areas. The emotional increment in blockchain innovation has given numerous new application openings, including social insurance applications. This overview gives a far-reaching audit of rising blockchain-based the medicinal services advancements and related applications. In this request, we point out that the open research matters in this quickly developing field, clarifying them in certain subtleties. We additionally demonstrate the capability of blockchain innovation in reforming the medicinal services industry [20].

K. Kiran Kumar et al. [2019] taking a shot at blockchain said it is the drifting innovation that was proposed by Satoshi Takemoto. It is seen as a prospect by organizations, for instance, preparing and restorative administrations, on

account of its decentralization and non-changing features. In this paper, we are going to actualize another methodology for putting away understudy information and an approach to confirm understudy endorsements using blockchain innovation. In the present understudy, the management system substantive information symmetry exists among schools using associations. The highlights of blockchain's straightforwardness and unchanging nature are being clarified along with their use in the accompanying paper. The understudy information can be put away in the Blockchain organization in the Hyper ledger structure, which incorporates the jobs of understudies in colleges. This offers a basic undertaking on the utilization of blockchain development to Student-Management cooperation as a pilot progression for advancement sending [21].

Jesse Yli-Huumoet.al. [2016] emphasized that blockchain is a decentralized transaction, and data management technology developed first for Bitcoin cryptocurrency. The interest in Blockchain technology has been increasing since the idea was coined in 2008. The reason for the interest in Blockchain is its central attributes that provide security, anonymity, and data integrity without any third-party organization in control of the transactions, and therefore, it creates interesting research areas, especially from the perspective of technical challenges and limitations. In this research, we have conducted a systematic mapping study to collect all relevant research on Blockchain technology. Our objective is to understand the current research topics, challenges, and future directions regarding Blockchain technology from a technical perspective. The majority of research is focusing on revealing and improving limitations of Blockchain from privacy and security perspectives, but many of the proposed solutions lack concrete evaluation of their effectiveness. Many other Blockchain scalability related challenges, including throughput and latency, have been left unstudied. Based on this study, recommendations on future research directions are provided for researchers [22].

Patrick Ocheret.al. [2019] expressed that the rundown of a student's learning accomplishments is in a transcript or testament form. Be that as it may, definite data on the profundity of learning and how learning or lessons were led is absent in the transcript of scores. This work introduces the principal pragmatic usage of another stage for monitoring learning accomplishments past transcripts and authentications. This is accomplished by keeping up computerized hashes of learning exercises and overseeing access rights using savvy contracts on the blockchain. The blockchain of learning logs (BOLL) is a stage that empowers students to move their learning records, starting with one establishment, and then onto the next in a protected and undeniable arrangement. BOLL empowers existing learning information diagnostic stages to get to the learning logs from different organizations with the consent of the students or potential foundation who initially have responsibility for logs. The primary commitment of this paper is to explore how learning records could be associated crosswise over establishments utilizing BOLL. We present a diagram of how the usage was done, talk about asset prerequisites, and look at the favorable circumstances BOLL has over other comparative instruments [23].

The field of training innovation and the utilization of information-driven instruction in the field are still lingering behind (Siemens and Long 2011). One of the key difficulties here is the absence of information coherence. At the point when understudies change, starting with one organization then onto the next, their learning information remains, to a great extent, stationary, those gathered at past foundations not being accessible for investigation at present or future establishments. The circumstance causes a normal cold-begin issue, where the present organization's learning condition does not have adequate information for compelling personalization or adjustment when the student is first selected. In this paper, we propose an answer that empowers the coherent development of learning records utilizing a blockchain as a vehicle medium and stage for interfacing LRSs. Specifically, the accompanying issues are tended to by the proposed arrangement [23][24].

Guang Chen et al., [2018] stressed that blockchain is the center innovation used to make the cryptographic forms of money, just as a bitcoin. As a major aspect of the fourth modern insurgency since the innovation of steam motor, power, and data innovation, blockchain innovation has been utilized in numerous territories, for example, money, legal executive, and trade. The present paper concentrated on its potential instructive applications and investigated how blockchain innovation can be utilized to take care of some training issues. This article previously presented the highlights and focal points of blockchain innovation, followed by investigating a portion of the current blockchain applications for instruction [24].

## 3. Problem Statement

Security is one of the significant research issues in a learning management system where multiple databases are connected through the common gateway and communication lines. Different kinds of data are stored in different network segments in a specific server. In this research paper, the researcher focused on the significant research issues on homogeneously distributed databases in the learning management system concerning security concerns. Nowadays, mobile LMS apps enabled offline learning (access to training without the Internet connection) are slowly entering the LMS market. For such

apps, it is crucial that all training downloaded by users on their private or company-supplied mobile devices be encrypted to prevent data misuse. Strict authentication of learner credentials on the Mobile application is important too.

## 4. Research Objectives

The researcher emphasized that some of the research objectives are the most significant in distributed databases concerning security in the learning information system, as the researcher is aware that security is one of the big factors in the learning management system to protect data from unauthorized users in a distributed computing environment. The researcher stated that:

1. To identify the security factors in the learning management system.
2. To study the distributed database security barriers in a homogenous computing environment.
3. To study the Multi-Factor Authentication in the learning management system (LMS) using blockchain technology.

## 5. Conceptual Framework of The Research Study

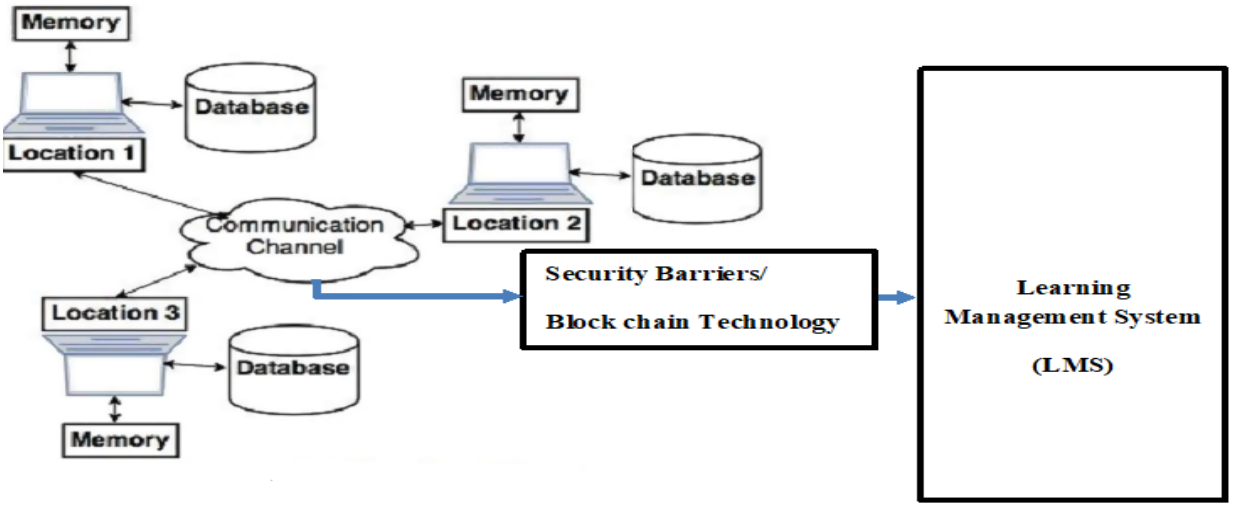


Fig. 5.1 Framework of the Proposed Research Study

## 6. Developing a Secure Distributed Databases

The growth of the net and electronic commerce has brought to the forefront the problem of privacy in transmission. Massive volumes of private and sensitive info are electronically transmitted and kept daily. What guarantees do you have that a message sent to a person isn't intercepted by another person and skimmed when it isn't theirs, and they shouldn't have access? Tools to confirm the privacy and confidentiality of paper-based communication have existed for a protracted time. Similar tools exist within the electronic communications arena.

Encryption is the ordinary philosophy for making a correspondence individual. Anybody expecting to send a non-open message to an alternate client encodes (enciphers) the message before sending it. Exclusively, the implied beneficiary knows about an approach to appropriately rework (translate) the message. Anyone the World Health Organization was "spying" on the correspondence would exclusively observe the scrambled message. Because they don't have the information to revamp it, the message would be of no use to them. All things considered, protection would be guaranteed in transmission.

Cryptographic systems can't be built up securely. Rather, the sole investigation is to imagine a scenario that someone discovers an approach to interpret a message without having direct information on the unraveling key. The RSA technique's security lies in the reality that the genuine fact that it's exceptionally difficult to issue extremely monstrous numbers. On the off chance that a hundred digit number square measure is utilized for p and letters of the letter set, the resulting n will be pretty much two hundred digits. The fastest renowned factorization equation would take unreasonable ache for Distributed Database Security transgressor to ever break the code. Elective methodologies for determinant d while not factorization n square measure similarly as intense.

## 7. Research Methodology Blockchainmethod

The Blockchain is encoded, conveyed database that records information, or, as such, it is a computerized database of any exchanges, contracts - that should be freely recorded. One of the key highlights of Blockchain is that this computerized database is open over a few large numbers of PC and will undoubtedly be kept in a solitary spot. The most energizing component of the square chain is that it enormously diminishes the conceivable outcomes of an information break. Interestingly, with the customary procedures in the square chain, there are various shared duplicates of the similar information base, which makes it hard to wage an information rupture assault or digital assault. With all the extortion safe highlights, the square chain innovation can possibly alter different business divisions and make forms more astute, secure, straightforward, and increasingly effective compared with the customary business forms.

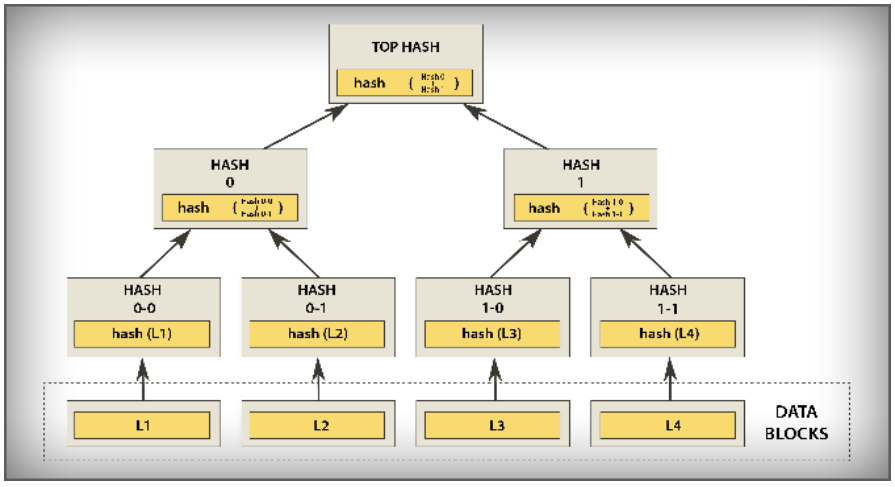


Fig. 7.1 Structure of Block-Chain Technology

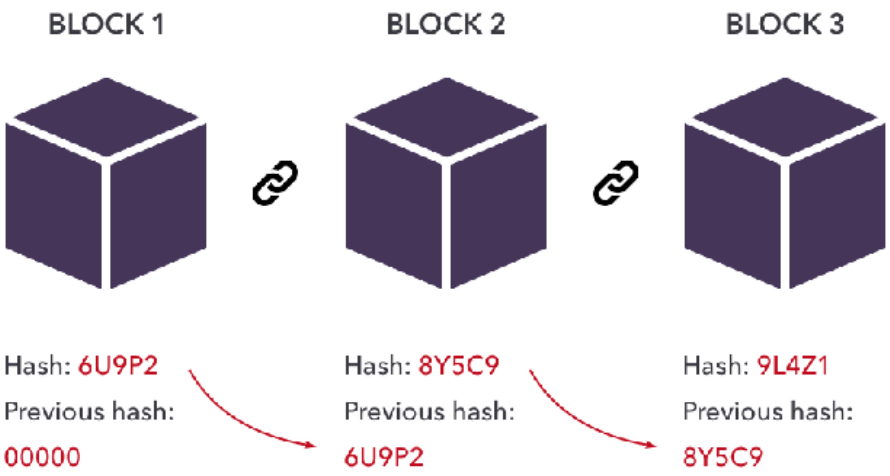


Fig. 7.2 Structures of Data in Block-Chain Technology

The root shows the hash of the current block transactions and computed according to a Merkle tree algorithm, also called a binary hash tree. It works as follows:

1. Initially, the system computes the hashes of all transactions in the block.
2. Next, the system divides these transactions into pairs and computes the hash of the sum of these pairs of transactions.
3. Then the system divides the calculated sums into pairs and computes them again and again until a single hash-code, the so-called root, is calculated.

After the signature of the transaction is generated and received, any third party can verify it with the help of the public key in the following way:

1. Confirm that the signature components, numbers r, and s, are both in the range of 1 to n-1,
2. Compute z = hash (transaction) mod n
3. Compute w = 1/s mod n.
4. Compute u = z × w mod n,
5. Calculate v = r × w mod n,
6. Calculate the point (x, y) = (u × G) + (v × Keypub)
7. Confirm that r = x mod n. The verified signature will be invalid if r ≠ x mod n.

## 8. Analysis and Discussion

The blockchain technology has been one of the major mechanical leaps in this century. The blockchain application enables a system of clients to perform exchanges without requiring the supervision of anyone on the system, or an outsider. Everything is encoded, and no one can mess with the square chain without every other person noticing right away

There are a couple of ways that a square chain can be utilized in conveying stockpiling programming. A standout amongst the most widely recognized is to:

1. Break up information into lumps.
2. Encrypt the information, so you are the only one with access to it.
3. Distribute records over a system such that it implies every one of your documents is accessible, regardless of whether a part of the system is down.

Basically, rather than giving your documents to an organization like Amazon or Microsoft, you can convey it to a system of individuals everywhere throughout the world. The cloud is shared by the network, and no one can peruse or alter any other individual's delicate information. At the end of the day, you remain in charge. This could likewise be helpful in open administrations to guard open records, accessible, and decentralized.

## 9. Research Issues and Challenges

The researcher found that some of the significant research issues and applications utilizing Blockchain innovation are portrayed as required.

1. Reliability: the decentralized idea of a blockchain system changes the database of the whole exchange records from shut and brought together records kept up by just a couple of authorized foundations to open dispersed records kept by a huge number of hubs. The disappointment of a solitary hub does not influence the task of the entire system. This stays away from the single purpose of disappointment and guarantees the unwavering high quality of the applications which

were based on the Blockchain innovation.

2. Trust: The blockchain system makes trust decentralized, as well. It's not at all like the brought together trust we underestimate, for example, focal governments issuing monetary forms and business banks has blockchain system gone about as new trust bearers with decentralized records. These records are shared among a system of sealed hubs (Underwood 2016).
3. Security: The blockchain system utilizes the single direction hash work, which is a scientific capacity that takes a variable-length information string and changes it to a fixed-length twofold grouping. The yield bears no clear relationship to the info. The procedure is difficult to invert because, given only the yield, the info is difficult to decide (Yli-Huumo et al. 2016). Besides, the recently created square is carefully following the direct succession of time.
4. Efficiency: all information, consequently, go through the pre-set methodology. Subsequently, Blockchain innovation can altogether lessen the expense of work as well as improve proficiency. For the advanced money of Blockchain1.0, the mechanization of the appropriated record is, for the most part, the robotization of repayment. Blockchain innovation could speed the clearing and settlement of certain budgetary exchanges by decreasing the number of middle people included, and by making the compromise procedure quicker and increasing productivity (Wang et al. 2016).

Blockchain innovation does guarantee information security, and also information genuineness. One of the fundamental functionalities requested from designers is how to improve execution and to shield information from being altered. However, much as could be expected, and to guarantee the realness of information and the total nonappearance of the likelihood of changes in the Audit Trail, security authorities keep on scanning for better innovations.

As a feature of our key approach of nonstop improvement and the usage of rising advancements, Flex Databases grows new usefulness utilizing Merkle tree calculation. The new capacity structure of the Flex Databases Blockchain Audit Trail will be a tree with hashes from individual information obstructs in its leaf hubs and interior vertices that contain hashes from qualities held in the kid vertices. The root hub of the tree contains a hash from the whole informational collection; that is, the hash tree is a unidirectional hash work that guarantees information consistency through the relationship of the parts which make the entire information tree.

6.

In our rendition of the usage, the essential passage comprises of its own hash identifier, a hash of every exchange, and the data of the particular Audit Trail section (An exceptional system record ID, username of the client who started the change, system time when the change happened just as the kind of progress and the section's past worth). Any adjustment in the system of any datum (to be specific, an Insert, Update, or Delete task) creates another Audit Trail exchange that gets its very own, one of a kind, hash identifier (right now we utilize the SHA-256 crypto calculation) and is composed of the most up to date exchange square. Along these lines, each new record turns into another connection in an unmodifiable chain which is indistinguishably associated with the majority of the past sections, since every passage in the chain is dependent on the sections before it.

All Flex Databases systems, as of now, put away utilizing appropriated groups. At every one of the end hubs of any group, the whole library of customer information is totally copied. All things considered, as per the standard of appropriated stockpiling of Blockchain and to build the degree of security and unwavering quality; we chose to actualize a circulated system for putting away the Audit Trail of a particular customer establishment of Flex Databases EDC. At a customer's solicitation, this can be a solitary server or numerous servers, to which all information from new exchanges is repeated continuously. At last, this innovation can be created and utilized by controllers to guarantee the unlimited oversight of information changes and their legitimacy. In the event that the database is introduced by the controller, that individual will consistently have the option to check the veracity and authenticity of any information exchange that has happened in the system and can follow the total life cycle of any section.

## 10. Significance of Blockchain Technology In Lms

1. Peer to peer systems can exceptionally increase download speeds (like torrenting).
2. Data and information are disseminated everywhere throughout the world, so it is exceedingly accessible when you need it.
3. There is no need to stress over any other individual approaching any of your information.
4. With a vast system with numerous solid members, shrewd strategies could mean an exceptionally low dimension of excess factor, even as low as 1.5.
5. The changeless nature of the square chain records implies you can know whether a document is exact and unaltered.

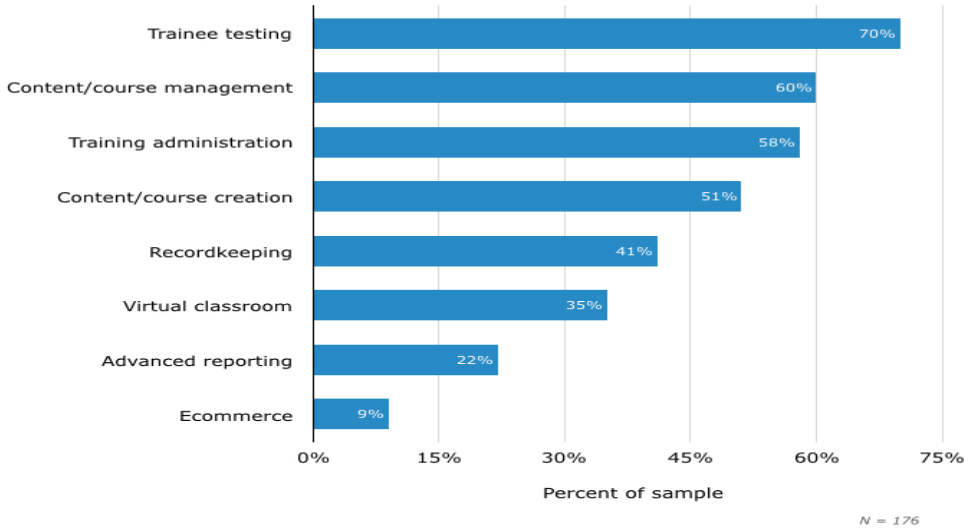


Fig. 9.1 Source: Statistics Blockchain Technology in LMS

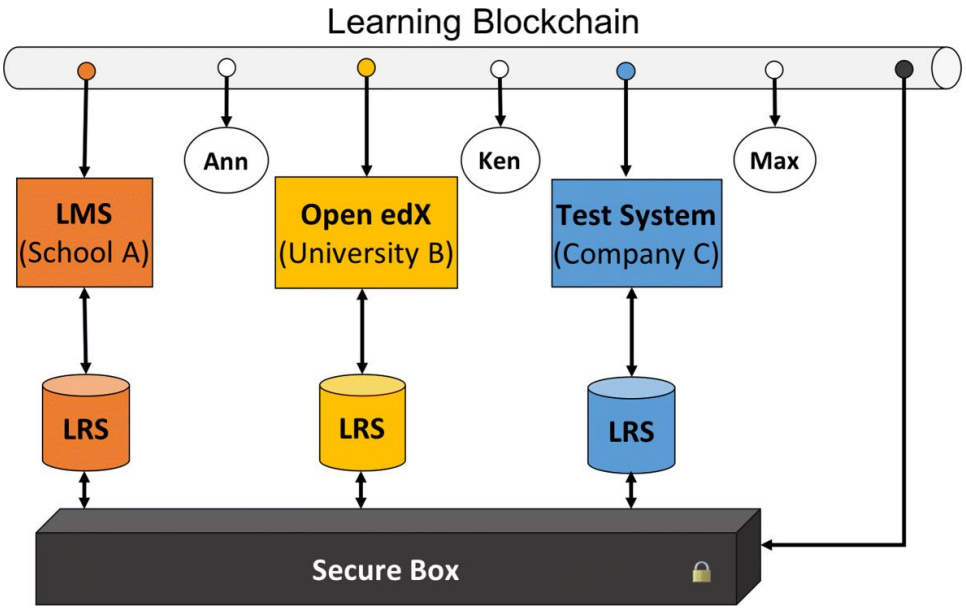


Fig. 9.2 Sources: Springer, Usage of Block-Chain Technology in LMS

The blockchain technology allows the replacement of this centralized database structure with the distributed database by mistreatment of the general public key algorithmic rule, hash encoding technique, and low cost supporting the distributed process structure. The thing with blockchain technology is that the biggest threat to the payment relay system as a result of Peer to Peer (P2P) monetary transactions are attainable between parties without the involvement of a 3rd party (financial company or trustworthy third party) as long as Internet association is in the market. Despite the vast quality of on-line education platforms, the research scholars aren't enthusiastic when learning some courses in academic institutions pushing forward the certification of learning of online education system, which is conducted due to the lack of infrastructure or hires by the private agencies. The security is the main concern in the learning management system in case of loss of certificates, undergoing a complicated and inefficient method to get another copy of the certificate from the platform or varsity. The blockchain technology plays a significant role in this regard and provides an easy,

economical answer to certification of learning results, particularly educational certificates.

## 11. Conclusion

In this research paper, the researcher emphasized the database distribution and security issues in the learning management systems to identify the security parameter, which is significant in providing the secure database application in the learning management system and its usage. The researcher used the blockchain methodology to provide highly secure data in database distribution concerning certificates in case of loss, re-issues, global authentication for the learning management system, secure online tutorial. In general, Blockchain is a list of records, which can be continuously enhanced with more records. These records, so-called blocks, are linked together like a chain by cryptographic technologies. That's why this technology is called blockchain. Each block includes a secured hash that links to the previous block, the data of the transaction, and the timestamp. The Blockchain is not stored on a single central server. It is deposited on many different computers, so-called nodes, and will permanently be updated. This storage method ensures that verification of the information is possible at any time, and manipulation of data is very difficult. The researcher also emphasized that blockchain technology is the exploration of distribution data handling and drive, a new way of decentralized application, and it provides a highly secured data transmission in the learning management system (LMS).

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