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5. Application of Blockchain Technology in Library Service: A Study

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Abstract:

Blockchain Technology is incredibly advanced and new tech within the field of library services. This paper aims to analyze the applications of blockchain technology in modern-day libraries. Information for the study was collected extensively from on-line sources. The study found that blockchain technology are often adopted in libraries in numerous ways that like for making associate increased data system, protective digital initial sale right, peer to peer sharing so on. Finally a broad discussion on major advantage and disadvantage of using blockchain technology in the field of library as well as all the area where this technology applicable and it may faces these challenges.

Keywords:

Blockchain Technology, Architecture, Library, Application of Blockchain Technology in Library service.

5.1 Introduction:

Societal changes have created teams of individuals who area unit off from their residency on a permanent or temporary basis thanks to status, statelessness, employment (business-related or seasonal work) or travel, and access to data as provided by libraries has to move with these people. Individuals of all ages who area unit homeless, transient, immigrants, displaced, or off from their usual home base want all sorts of data resources that embody support for acquisition, community integration, new talent development, employment services, research, disaster relief, and amusement. Libraries will give services to those communities that they cannot get anyplace else; but, in most instances these people cannot get a identity card and area unit ineligible to require materials out of the library. This downside will be resolved through the employment of associate practical blockchain-based system that crosses all sorts of library systems and a secure verified digital identity which will be employed in taking part libraries to realize access to data. Blockchain are going to be wont to give unencumbered access to digital content and print collections to all or any potential users in taking part library systems whereas managing risk to confirm that the privacy and private identity of every user is secure. Sovereign Identity (SSI) could be a blockchain application that allows a private or organization to own sole possession and management of their digital and analog identities. Data acquisition and digital inclusion efforts are going to be increased as users gain access to all or any resources in those libraries through the creation of their secure and personal digital identity.

5.1.1 Literature Review:

A literature review was conducted using different websites, blogs and journals through internet. The focus was on articles which outlined what Blockchain technology was, how it could be used, how it is being used, the legal implications of using Blockchain in contracts and the implications for libraries. (Hoy, 2018) noted the potential use of Blockchain for libraries and medical records. (Nowinski & Kozma, 2017) Discuss how Blockchain may be used to "disrupt the existing business models and to explore how this may occur".

The blockchain project of San Jose State University explores the technology for building an enhanced metadata system for the libraries, protecting digital first sale rights, host digital peer- to- peer sharing (Ways to Use Blockchain in Libraries, 2017). (Coghill J. G., 2018) Noted the possibility ofblockchain for the transfer of fund from libraries to vendors and maintaining electronic receipts as digital evidence.

5.1.2 Objective of the Study:

- To know about the basic concept of Blockchain Technology?
- To know how does Blockchain Work?
- Technical architecture view of blockchain
- Application of Block chain technology in Library Service
- Advantage and Disadvantage of Blockchain in Library services

5.1.3 Methodology & Limitation of the Study:

Blockchain technology concept, in its entirety, is new to the field of Library & Information Science. This study is done by collecting and collating information from websites and some renowned journals. It is observed that sufficient information related block chain technology application in library is not available. Therefore, in this study all comprehensive information pertaining to Blockchain Technology is not provided.

5.2 What is Block Chain Technology?

Blockchain, typically named as Distributed Ledger Technology (DLT), makes the history of any digital plus unalterable and clear through the utilization of decentralization and science hashing. a straightforward analogy for understanding blockchain technology may be a Google Doc. after we produce a document and share it with a bunch of individuals, the document is distributed rather than traced or transferred.

This creates a decentralized distribution chain that offers everybody access to the document at a similar time. Nobody is latched out awaiting changes from another party, whereas all modifications to the doc area unit being recorded in period of time, creating changes fully clear. Blockchain is associate particularly promising and revolutionary technology as a result of it helps cut back risk, stamps out fraud and brings transparency in a very ascendible method for myriad uses (builtin.com) (What is Blockchain Technology? How does it work?).

5.2.1 How Does Blockchain Work?

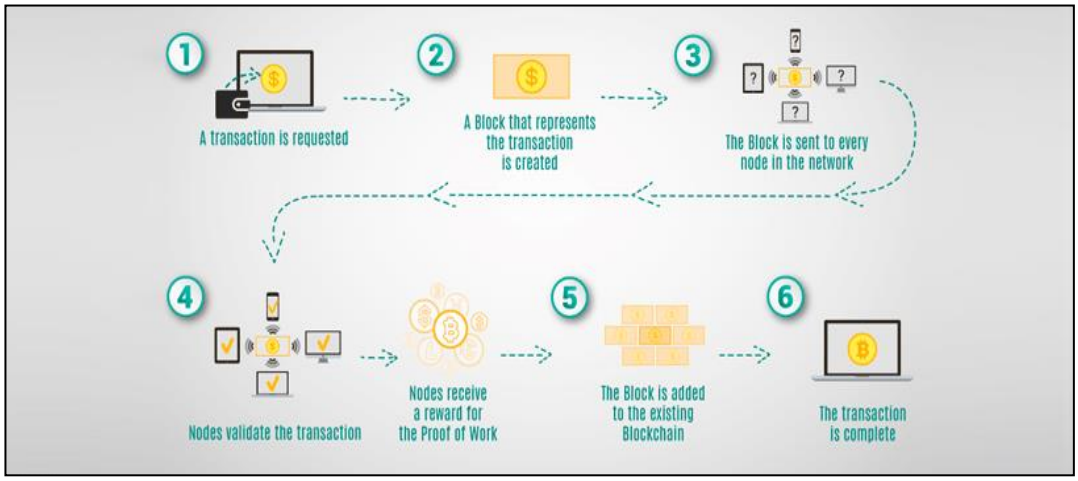

Figure 5.1: Source: https://www.zignuts.com/blogs/how-blockchain-architecture-works-basic-understanding-of-blockchain-and-its-architecture/

5.2.2 Technical Architecture View of Blockchain:

In general, a blockchain system consists of a number of nodes, each of which has a local copy of a ledger. In most systems, the nodes belong to different organizations. The nodes communicate with each other in order to gain agreement on the contents of the ledger and do not require a central authority to coordinate and validate transactions (builtin.com).

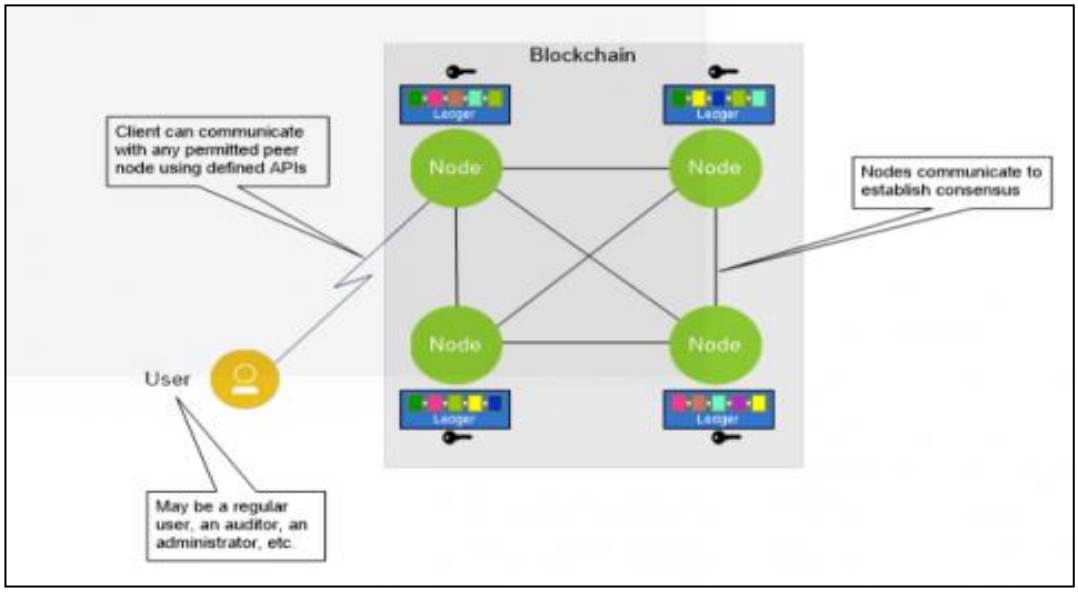

Figure 5.2: Source: https://www.zignuts.com/blogs/how-blockchain-architecture-works-basic-understanding-of-blockchain-and-its-architecture/

The process of gaining this agreement is called consensus, and there are a number of different algorithms that have been developed for this purpose. Users send transaction requests to the blockchain in order to perform the operations the chain is designed to provide. Once a transaction is completed, a record of the transaction is added to one or more of the ledgers and can never be altered or removed. This property of the blockchain is called immutability (ZIGNUTS, 2018).

5.2.3 Different Types of Block Chain:

a. Public Blockchain:

A public Blockchain network or permission less Blockchain network is totally open-ended and anyone willing to participate during this quite network will participate with none permission. This can be the foremost and solely distinction between public and personal Blockchain network. Anyone will participate within the permission less network, execute the accord protocol and maintain the shared open public ledger. Benefits of Public Blockchain: safer than non-public network. Disadvantages of Public Blockchain: Low Privacy, immense process power and energy is needed, less eco-friendly (ZIGNUTS, 2018).

b. Private Blockchain:

A Private Blockchain Network needs letter of invitation to participate within the network. The invite should be valid either by network starter or by the rules/conditions placed by the network starter. Permission Blockchain Network puts restriction to the entry of participant and permits solely the type of participant that's needed within the network. Benefits of Public Blockchain: exaggerated privacy, Environment-friendly as less process power is needed to realize the accord. (as within the case of Public Network). Disadvantages of personal Blockchain: Less secure as compared to public network (ZIGNUTS, 2018).

5.2.4 Why Blockchain Technology Used in Library?

Libraries have a major opportunity to use blockchain technology to advance privacy for users, increase collaboration, and transform the way they work with each other and their communities. By keeping up to date, libraries can evaluate blockchain opportunities and make the best use of this technology. (Meth, 2019)

5.2.5 Application of Block Chain in Library:

Build associate increased information System for Libraries, information Centres: Building a distributed, permission-less information archive has maybe the foremost tumultuous potential. As a result of blockchain operate as a kind of informational ledger that doesn't need a centralized gate keeping organization, they may be accustomed build a really distributed information system for libraries and connected organizations. A blockchain OCLC, if you may such a system would be accessible to any organization, who wishes, with no further expenditures. The system would scale cleanly, whereas still maintaining quality of information through selective reading/output alternative supported hash linguistic communication.

a. Protect Digital Initial Sale Rights: Another probably disruptive plan for data ecosystems is that of the Digital initial Sale as results of obvious possession and digital scarceness. A rights management system engineered on blockchains is clear and at the centre of the many current blockchain comes. Of interest to libraries, specifically, is that the potential for these comes to be a lever for digital initial sale rights.

Mythical being Griffey is within the method of researching such associate degree argument with associate degree internationally-regarded copyright skilled, and can be performing on a paper declaring such over the summer 2017. Whereas DRM of any type isn't fascinating, if by victimization blockchain-driven DRM we have a tendency to trade for the flexibility to possess recognized digital initial sale rights, it's going to be a worthy discount for libraries.

For example: Blockchain involves E-Books, DRM enclosed, https://decent.ch/en/decent-use-case-for-e-book-blockchain-distribution

b. Host Digital Peer-To-Peer Sharing: Library facilitation of peer-to-peer sharing on the far side simply books through blockchain technology might facilitate members of the community attest the supply of various tools or services for a lot of economical sharing economy.

Once fitting meets, performing on necessary project, or fitting reports, blockchain offers folks the tools required for it. It associate degree approach to networking, once eager to file share, may be a distinctive approach. Tho' blockchain makes it tougher to alter these shared documents, it will facilitate in creating it safer.

c. Connect to a Network of Libraries/Universities: Libraries and universities would possibly use the blockchain for the Inter-Planetary classification system (IPFS), a peer to see protocol for a future web that uses bit Torrent, unpleasant person and Blockchain. IPFS circumvents the gate keeping of ISPs and huge web firms. The system would wish seeders on the net to stay copies of internet sites on their computers.

A network of libraries/universities might serve to validate the credentials of a given copy of any website–similar to what miners do for Bitcoin.

d. Facilitate Partnerships across Centres/Organizations: Libraries will partner with museums, universities, and government agencies to share brandy records, authority management, and user-generated content through a blockchain framework.

e. Support Community-Based Collections: A protocol for supporting community-based assortments and borrowing might extend the standard library collection on the far side its walls into the community.

Libraries might deploy a blockchain-based system bedded with “smart contract” code to facilitate the compartmentalisation and sharing of community things (tools, cars, expertise) in a very sharing network. The blockchain would govern who has borrowed things, who originally loaned them, etc. this might be a partnership with code developers and businesses.

5.3 Re-examine Expectations for methods Public Libraries Contribute to town Service:

Examination of civic innovations mistreatment blockchain technology and development of a explanation for why the library can be a perfect home for such initiatives. Libraries have sturdy community trust and voters can connect the aim of libraries to the goals of those new innovations.

a. Give Badges for Skills training: Blockchain may support "badging" for skills nonheritable through coaching. Libraries may attest the content of private skills portfolios.

b. Advantages of Blockchain: Blockchain may be wont to develop a world interlibrary loan pilot for the International Federation of Library Association's (IFLA) voucher system. IFLA provides re-usable vouchers to assist libraries simply obtain international interlibrary loan requests. Every voucher represents a typical payment for one dealing. Blockchain would lend itself well to international sick due to the foreign currency transactions that happen as a part of this Interlibrary Loan exchange (blockchain would create foreign monetary transactions easier) and thanks to transactional nature of interlibrary loans typically.

Blockchain may be wont to verify the accuracy and consistency (validity) of information over its lifecycle. This is able to involve comparison the hash of the initial records with a hash recorded on the blockchain. If the 2 hashes don't match, the records are altered in a way (Blockchain and also the way forward for libraries: an interview with Sandra Hirsh and Susan Alman).

c. Accuracy of the Chain: Transactions on the blockchain network area unit approved by a network of thousands of computers. This removes most human involvement within the verification method, leading to less human error associated a correct record of data. Even though a pc on the network was to create a process mistake, the error would solely be created to at least one copy of the blockchain. So as for that error to unfold to the remainder of the blockchain, it ought to be created by a minimum of fifty one of the network's computers—closes to impossibility for an outsized and growing network the dimensions of Bitcoin's.

d. Cost Reductions: Typically, shoppers pay a bank to verify dealings, an official to sign a document, or a minister to perform a wedding. Blockchain eliminates the requirement for third-party verification and, with it, their associated prices. Business homeowners incur atiny low fee whenever they settle for payments victimization credit cards, for instance, as a result of banks and payment process corporations ought to method those transactions. Bitcoin, on the opposite hand, doesn't have a central authority and has restricted dealings fees.

e. Decentralization: Blockchain doesn't store any of its info in an exceedingly central location. Instead, the blockchain is derived and unfold across a network of computers. Whenever a replacement block is another to the blockchain, each pc on the network updates its blockchain to mirror the amendment. By spreading that info across a network, instead of storing it in one central information, blockchain becomes harder to tamper with.

If a duplicate of the blockchain fell into the hands of a hacker, solely one copy of the data, instead of the whole network, would be compromised.

f. Efficient Transactions: Transactions placed through a central authority will take up to some days to settle. If you conceive to deposit a check on Friday evening, for instance, you'll not really see funds in your account till weekday morning. Whereas monetary establishments operate throughout business hours, 5 days every week, blockchain is functioning twenty four hours each day, seven days every week, and one year a year. Transactions are often completed in as very little as 10 minutes and might be thought-about secure once simply some hours. This can be notably helpful for cross-border trades, which sometimes take for much longer due to time-zone problems and also the undeniable fact that all parties should ensure payment process.

g. Private Transactions: Many blockchain networks operate as public databases, which mean that anyone with an online association will read a listing of the network's dealings history. Though users will access details concerning transactions, they cannot access characteristic info concerning the users creating those transactions. It's a standard misperception that blockchain networks like Bitcoin area unit anonymous, once if truth be told they're solely confidential.

That is, once a user makes public transactions, their distinctive code referred to as a public key, is recorded on the blockchain, instead of their personal info. If an individual has created a Bitcoin purchase on associate exchange that needs identification then the person's identity continues to be coupled to their blockchain address, however a dealings, even once tied to a person's name, doesn't reveal any personal info.

h. Secure Transactions: Once dealing is recorded, its believability should be verified by the blockchain network. Thousands of computers on the blockchain rush to verify that the small print of the acquisition area unit correct. Once a pc has valid the dealings, it's another to the blockchain block. Every block on the blockchain contains its own distinctive hash, together with the distinctive hash of the block before it. Once the data on a block is emended in any means that block's hashcode changes— however, the hash code on the block once it might not. This discrepancy makes it very troublesome for info on the blockchain to be modified by surprise.

i. Transparency: Most blockchains area unit entirely ASCII text file software system, this suggests that anyone and everybody will read its code. This offers auditors the power to review Cryptocurrencies like Bitcoin for security. This additionally implies that there's no real authority on who controls Bit coin's code or however it's emended. Due to this, anyone will counsel changes or upgrades to the system. If a majority of the network users agree that the re-creation of the code with the upgrade is sound and worthy then Bitcoin is often updated.

5.4 Disadvantages of Blockchain:

The challenges are having the time and resources to develop use cases which will offer direction to libraries for mistreatment blockchain as a thought tool.

Blockchain is associate untested construct in libraries, and there'll still be scepticism and reluctance to pursue its use till there are credible samples of the ways in which blockchain will be used successfully for library processes. Alternative problems impacting the implementation of blockchain involve standards, privacy, and legalities, and every of those are highlighted within the book.

While there are vital upsides to the blockchain, there also are vital challenges to its adoption. The roadblocks to the appliance of blockchain technology these days aren't simply technical.

The $64000 challenges area unit political and regulative, for the foremost half, to mention nothing of the thousands of hours (read: money) of custom software system style and back-end programming needed to integrate blockchain to current business networks. Here are a number of the challenges standing within the method of widespread blockchain adoption.

a. Technology Price:

Although blockchain will save users cash on group action fees, the technology is much from free. The "proof of work" system that Bitcoin uses to validate transactions, for instance, consumes Brobdingnagian amounts of process power.

Within the globe, the facility from the voluminous computers on the Bitcoin network is on the point of what Kingdom of Denmark consumes annually. Assumptive electricity prices of $0.03~$0.05 per kilowatt-hour, mining prices exclusive of hardware expenses area unit concerning $5,000~$7,000 per coin.10

Despite the prices of mining Bitcoin, users still come on their electricity bills so as to validate transactions on the blockchain. That's as a result of once miners add a block to the Bitcoin blockchain; they're rewarded with enough Bitcoin to form their time and energy worthy. Once it involves blockchains that don't use cryptocurrency, however, miners can got to be paid or otherwise incentivized to validate transactions.

Some solutions to those problems area unit starting to arise, for instance, Bitcoin mining farms are created to use solar energy, excess fossil fuel from fracking sites, or power from wind farms.

b. Speed Unskillfulness:

Bitcoin may be a excellent case study for the potential inefficiencies of blockchain. Bit coin's "proof of work" system takes concerning 10 minutes to feature a brand new block to the blockchain. At that rate, it's calculable that the blockchain network will solely manage concerning seven transactions per second (TPS).

Though alternative Cryptocurrencies like Ethereum perform higher than Bitcoin, they're still restricted by blockchain. Inheritance whole Visa, for context, will method 24000 TPS.

Solutions to the present issue are in development for years. There are presently blockchains those are self-praise over 30,000 transactions per second.

c. Illegal Activity:

While confidentiality on the blockchain network protects users from hacks and preserves privacy, it conjointly permits for banned commerce and activity on the blockchain network. The foremost cited example of blockchain getting used for illicit transactions is perhaps the Silk Road, a web "dark web" drug marketplace operational from Gregorian calendar month 2011 till October 2013 once it had been pack up by the Federal Bureau of Investigation.6

The website allowed users to browse the web site while not being half-tracked mistreatment the Tor browser and build banned purchases in Bitcoin or alternative Cryptocurrencies. Current U.S. laws need money service suppliers to get info concerning their customers after they open associate account, verify the identity of every client, and make sure that customers don't seem on any list of celebrated or suspected terrorist organizations. This method will be seen as each a professional and a con. It offers anyone access to money accounts however conjointly permits criminals to a lot of simply interact. Several have argued that the nice uses of crypto, like banking the unbanked world, outweigh the dangerous uses of cryptocurrency, particularly once most criminal activity continues to be accomplished through untraceable money.

d. Regulation:

Many within the crypto area have expressed issues concerning government regulation over Cryptocurrencies. Whereas it's obtaining more and more troublesome and close to not possible to finish one thing like Bitcoin as its localized network grows, governments may on paper build it banned to have Cryptocurrencies or participate in their networks. Over time this concern has full-grown smaller as massive firms like PayPal begin to permit the possession and use of Cryptocurrencies on its platform.

5.4 Findings & Conclusion:

Blockchain technology is one in all the latest technology trends in libraries. It's undisputed that blockchain has wonderful potential applications in trendy libraries. It's primarily a ledger technology that uses cryptanalytic techniques and distributed agreement algorithms to induce the options of traceability and un-changeability (Chen etal, 2018). These options are benefitted the libraries for winding up varied operations like protective and sharing authoritative info, preventing copyright problems and digital peer- to- peer sharing etc. It is a immense and untapped space of study that creates each challenges and opportunities to the future educators, researchers and developers. By coming back days, the technology are a lot of visible in libraries as several of the libraries globally have started engaged on a way to harness these in libraries (Babu & Babu, 2020).

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