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# Embracing Blockchain Technology in Academic Libraries in Indian Scenario: A Conceptual Study

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**Abstract**

In this computerised world with expanding Web access, the blockchain innovation can be utilised to ratify and store online exchange records like Bitcoin. In this process, it is very tough to abrogate, repudiate, and fake the transactions. Once data or information is stored in blockchain, it is highly impossible to tamper, duplicate, or erase it. The blockchain is used to increase the security in transferring of things, such as money, property, contracts, and so on. Libraries are involved in many online transactions. Therefore, it is best to adapt blockchain technology in libraries, as they are always involved in gathering, preserving, and sharing authoritative information. Here, the authors have made an attempt to find ways to implement blockchain technology in the libraries in the Indian scenario. Initially, the authors studied the present status of blockchain technology in the libraries. Later, the authors identified places where blockchain technology could be implemented, and thus increase security. The authors have explained the concept of blockchain technology, how it works, how to install it, use it, and so on. Also, the advantages and disadvantages of blockchain technology are listed.

**Keywords:** Blockchain Technology, Academic Libraries

## Introduction

Blockchain technology could be identified as a chain of blocks which contains information. It is highly impossible to backdate or tamper with the digital documents which are time-stamped using blockchain techniques. The chief benefit of blockchain technology is that without the presence of a central server, it is impossible to duplicate the records.

The librarians can accomplish their work by utilising blockchain innovation, particularly in the ground of scientific research production. Journal publications could be time-stamped and its versions verified using blockchain technology. Irving and Holden practically tested the utilisation of the Bitcoin blockchain "as a minimal expense, autonomously certain strategy that could be broadly and promptly used to review and affirm the dependability of logical investigations".

Another central benefit of blockchain innovation is that it very well may be utilised as a DRM (Digital Right Management) instrument in libraries, as electronic library assets are characteristically reproducible, which may make issues for libraries, just as distributers. As of now, the DRM (Digital Right Management) device is being utilised by the distributers to forestall duplicating of their distributions, which is not a hundred per cent dependable. By utilising blockchain innovation, any library can make a one-of-a-kind record, which can be gotten to by everything that can possibly be attached to electronic assets and utilised as a technique to designate "provable shortage" of that material. Blockchain would assist with improving exercises which are identified with libraries, like academic distributing, content spreading, and copyright implementation.

## Literature Review

The present use and future implications of blockchain technology in academia have been discussed by Chen, Xu, Lu and Chen (2018), Turkanovic, Holbl, Kosic and Hericko (2018), Grech and Camilleri (2017), Sharples and Domingue (2016), Rooksby and Dimitrov (2017), Domingue and Bachler (2018), and Grather et al. (2018). All are exemplifying the present and future potential applications of blockchain technologies in academia, like issuing valid certificates, summative evaluation

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for learning outcomes, storing students' grades, getting people to register for online courses, making digital payments, and so on.

In 'Blockchain for Research', Rossum from Digital Science depicts advantages like information colocation, local area self-adjustment, disappointment investigation, and extortion anticipation (Rossum, June 2019). Blockchain is a phenomenal method to follow copyright. A few blockchains have as of now been produced for photographic artists, specialists, and artists. Models incorporate photograph chain, duplicate track, binded, and dotBC.

Blockchain could protect advanced first-deal rights, which are vital to libraries having the option to share such substances. "While DRM of any kind isn't attractive, if by utilizing blockchain-driven DRM we exchange for the capacity to have perceived computerized first deal rights, it could be a worthy bargain for libraries." To help such limitations, another utilisation for blockchain created by organisations, for example, LibChain, is open, unquestionable, and unknown access to the executives to library content.

## Objectives of the Study

- To understand the concepts and ways of implementing the blockchain technology in academic libraries.
- To explore different sections in the library for adapting blockchain technology.
- To discover the possibilities of increasing the security of the library products and transactions by adapting blockchain technology.

## What is Blockchain?

The concept of blockchain technology is indeed pretty modest; it is a type of store house of information. It is better to understand what a store house of information is first to understand about blockchain technology.

A store house of information is nothing but a database where we can store information in an electronic format in a computer. Data or information in databases is naturally structured in a table format to provide for easier searching and filtering for particular information.

- Blockchain could be the particular type of database.
- Data is being stored in blocks and chained together later in a blockchain mechanism, which is a different storage method from a natural database.
- The block is chained with a past block whenever it is loaded with new information, to make information affixed together in a sequential request.
- All kinds of information could be stored on a blockchain, which can be used as a ledger for transactions.
- Wherever it is required it can be used in a decentralised mode, where a single person or group does not have control, unless the rest of the users collectively permit modifications or changes.
- It is highly impossible to revert or delete the transactions once it is done, since a decentralised blockchain is immutable, which means that the information entered is permanently logged and available to anyone.

The blockchain is a set of rules, like a software protocol, and the Internet is required to use the blockchain. It will be treated as a meta-technology since it affects other technologies.

## How Does Blockchain Work?

First, we have to understand what a blockchain is. Blockchain is made up of two words – 'BLOCK' and 'CHAIN'. When we enter data or information, it will go to a block; once a block is filled, it will be chained to a previous block, as shown in Fig. 1.

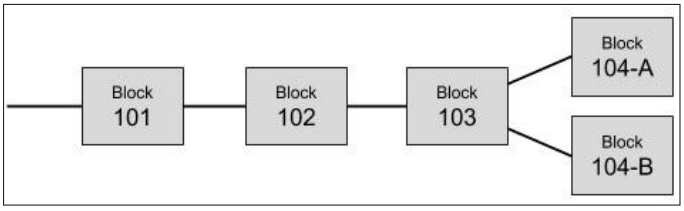


**Fig. 1**

In Fig. 1, we can see that there are two sub-blocks after Block 3. Both the sub-blocks are legitimate. So the following mined square might be added to any of the sub-blocks. Assume that the miner adds the recently mined block to Block 104-A. The sub-block containing Block

104-A will be longer than the sub-block containing Block 104-B, as demonstrated in Fig. 2.

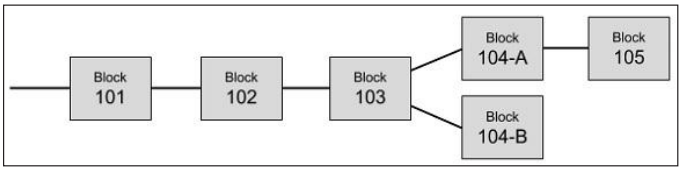


**Fig. 2**

In Fig. 2, we can see that Block 104-B must be cleansed, as the longest blocks consistently win, and the more limited ones are cleansed in the Bitcoin concept. All of the exchanges made in Block 104-B will be back in the exchange pool, so that they are mined and added to some future blocks prior to cleansing them. In this manner the struggles are settled and just one single chain of blocks is kept up by the framework.

## Installation Process of Blockchain

The following commands will show you how to install the blockchain and start the Ethereum hub to perform fundamental exchanges.

There are mainly three tools, as mentioned below:

- Implementation of GEth (Go Ethereum).
- TestRPC, which we need to test-set Smart Contracts.
- Truffle Build system (framework).

First, it is required to install NODEJS, as most of the tools which will be used are dependent on JavaScript.

Start installation of NodeJS and NPM using the following commands.

Note: The text which is in italics is the command.

Step 1: Open the terminal or press Control+Alt+T

Step 2: Type "*sudo apt-get install nodejs"*

Step 3: Type "*node-v"* to check the nodejs version

Step 4: Type "*sudo apt-get install npm"*

Step 5: Type "*npm-v"* to check the NPM version

Now, we have to install the GEth (Go-Ethereum)

To install the GEth, please use the following commands.

### Installation of GEth on UBUNTU Via PPAs

To enable our launchpad repository, run

Step 6: Type "*sudo add-apt-repository -y ppa:ethereum/ethereum"*

Now, the repositories will be updated by running the following command.

Step 7: Type "*sudo apt-get update"*

Now the stable version of Go-Ethereum has to be installed.

Step 8: Type "*sudo apt-get install ethereum"*

### Installing Test RPC

This is the time to install Test RPC.

Test RPC is only an Ethereum node emulator which is executed in the NodeJS. The main objective of this Test RPC is to quickly begin an Ethereum node for test and advancement. We need to see that Test RPC is only an emulator which is running as an in-memory process.

For instance, in the event that we put together a Smart Contract, it will not proceed in the event that we restart the Test RPC.

To install the Test RPC, the following command is used.

Step 9: Type "*sudo npm install -g ethereumjs-testrpc"*

### Installing Truffle

At this point, we need to introduce Truffle. Truffle is only a form of a build framework which deals with our Contract relics. It contains support for custom arrangements, library connecting, and complex Ethereum applications.

To install Truffle, use the following command.

Step 10: Type "*sudo npm install -g truffle"*

Now the installation is done.

Once installation is done, we have to set up a private Ethereum network, which we can then use.

## Different Modules to Adapt Blockchain Technology in the Library

### Acquisition Module

Acquisition is one of the essential modules of any library, as librarians are building a collection of books, journals, and magazines, and kindred resources, which is a major and important function of the acquisition module. It is accountable for all aspects of acquiring library resources for libraries. In this module, library materials are ordered by the librarians to the registered library vendor or publishers. In this process, smart contacts are being used by librarians and registered library vendors or publishers to cross-verify the terms and conditions of purchase and contract by using blockchain application. Scrambled keys might be accessed by both librarians and registered library vendors or publishers, which could twist the parts of a contract. The terms and conditions of an e-contract could only be renewed with the contract of both librarians and registered vendors of the library.

### Digital Preservation and Tracking

In the 21st century, library users are becoming e-resource savvy. Day by day they are losing interest in print material and turning towards e-materials. At the same time, digital preservation is the biggest challenge due to copyright issues in this Internet era. By using blockchain technology, one can track downloads and modifications, and hard copies of publications could be restricted by the publishers via e-agreements or e-contracts. Getting printed or distribution of printed materials such as articles and book chapters would be limited by the publishers if printing was synchronised to the initial e-agreement. A blockchain-based technology could not allow anybody to alter or modify any kind of document which is uploaded, time-stamped, and verified by the publishers. At the same time, the readers who wish to access the original resources can confirm that the content is unchanged or modified from the original by using the blockchain technology.

### Copyright and Royalty Defence

In this digital world, with increasing access to the Internet, people are more involved in research, and research content has grown, with the invention of new things. By using blockchain application, justice can be given to the inventors by significantly beefing up the security of e-content downloads and ensuring that the invention or creation is purchased and that the inventor or creator gets their fair royalty. The real-time and transparent royalty distribution facts would be informed to the inventors and content creators by employing the blockchain technology. By doing this, we can encourage the researcher and help them from being cheated or defrauded for their efforts. The research content can be secured from being edited, and the circulation of duplicated articles could be banned; the same will be applicable for all types of content, such as video and audio, and so on.

### BLOCKCHAIN-Based Currencies for International Financial Transactions

Nowadays, libraries deal with international publishers for procuring resources such articles, books, and standards, and payment can be made using blockchain-based currencies to avoid fake transactions.

### Fine Module

Where there is money, there is risk. And money is involved in this module. As libraries collect fines for late return of books, there is a chance of hacking the server and deleting the fine amount from the user's account, since some libraries store their data on a third-party server. One can avoid this kind of problem by implementing blockchain technology.

### Inter-Library Loan and Token System

The blockchain technology can be implemented at different levels, such as institution level, university level, state level, country level, and worldwide. The best idea is we have to implement blockchain technology at the global level, where every library will enter its holdings.

This is one of the best ways where a library's collections and holdings of data could be easily analysed across any library or information centre in the world.

No single library or information centre can fulfil all the requirements of the library user. The role of ILL in the library field is unfathomable in many aspects. A worldwide execution of blockchain innovation will significantly affect interlibrary loan (ILL) where library items can be pointed out in a faster way, and the practice of issuing and borrowing library items in ILL can be computerized through smart contracts with imparting organization. Libraries can be computerised in verifying accomplices, monitoring net getting versus net loaning, and sending materials where the protection by-plan highlights of blockchain applications would work well.

### Library Verification of Credentials (Information Literacy)

As libraries play an important role in digital and information literacy education, systems can be created by using blockchain application to verify the information.

### Library Card

Libraries are interacting with library patrons or users by creating their accounts in the library software, which could be cross-verified using a given novel patron ID and a library card. This card will permit library clients to collaborate with the library framework and administration. Library patrons can validate by themselves in online and get the access to electronic resources such as Electronic books and journals or databases and the same can be borrowed by them in online. For many years the system is being followed, and it has been running smoothly. However, nowadays, since many libraries are storing their data on a third-party server there is chance of missing data or information hacking. These kinds of issues could be resolved by adopting blockchain technology.

### Continuous Data Backup

Since backup is the backbone of a library, it has to maintain backup data every day. Generally, libraries take backup in two ways. One is manually, and the second is an automated backup system. In the latter scenario, at any time, data can be erased or stolen by the hackers. To escape from the hackers and resolve the infrastructure problems, we can use blockchain as a backup source for cloud data centres in automated systems or for any data, as it can be adopted with GPS receivers on its planes, which could resolve this concern.

In this way, we can use the blockchain to protect and secure user records, and acquired library materials data, and improve collections maintenance. Utilisation of extraordinary assortments will consider distinguishing proof and finding of special records. The academic record is another utilisation that fits blockchain by permitting specialists to record and time-stamp their thoughts and disperse information.

Blockchain innovation is having extremely tremendous extensions in libraries to make progress on the protection of library clients, expand joint effort, and change the manner in which they work with one another and their networks. By staying updated, libraries can survey blockchain application openings and utilise it.

## Advantages of Blockchain Technology in the Library

- Accuracy can be achieved by removing a huge amount of human involvement.
- We can reduce the cost factor by eliminating third-party certification.
- It can be made harder by decentralising it.
- It makes transactions private, secure, and efficient.
- It is transparent and highly standard technology.
- It is the system to secure personal information of all patrons of libraries with unstable or underdeveloped libraries.

## Disadvantages of Blockchain Technology

- It is highly technical.
- Qualified staff is required to implement it.
- It may take time to understand what it is exactly.
- Coding knowledge may be required to modify and use it.

## Conclusion

Blockchain technology is one of the newest technological trends. Blockchain technology has enough potential applications in hi-tech academic libraries. This technology is being implemented in many academic libraries for performing varieties of operations, such as preservation and sharing information, prevention of copyright issues, digital sharing, and so on. Though this is much unexplored technology, it provides both challenges and opportunities to the current librarians, educators, and researchers. The researchers are already exploiting this technology to its maximum for the advantage of academic libraries. Therefore, this will be more visible in libraries in the future.

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