

# The Study on Blockchain-Based Library Management and its Characterization

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## ABSTRACT

Blockchain is an innovative technology that could replace the current internet framework with a secure hash algorithm based on consensus-based transactions in P2P networks. Library management is an important part of modern libraries. In an advanced library, Library management is currently done on RFID-based kiosk implementation on KOHA or other Library management software to facilitate self-check-in and out. The problem of auditing and stocktaking of books, journals, periodicals is still a big issue despite library automation based on RFID. Blockchain-based library management systems being transparent and immutable records are the answer to full proof auditing and stocktaking in the present setup of advanced libraries. Blockchain library management system restricts the use of copyright digital materials. Here we are demonstrating an illustration of library management using blockchain written using solidity language on Remix IDE. The blockchain implementation of Library management of books is successfully executed on Remix IDE. In this paper, we have given the source code of the smart contract and its snapshots for the blockchain library management of books using blockchain technology.

**KEYWORDS:** Blockchain; Distributed ledger; Blockchain-based Library management; Ethereum, bitcoin, Peer-to-peer network

## INTRODUCTION

Blockchain is the new Web 3.0 redefining technology that is transparent with immutable records and zero duplicity in the electronic peer-to-peer networks. Blockchain is defined as a mathematical and technical transaction depending on a consensus-based algorithm with the electronic generation of records of blocks in P2P networks. Blockchain technology was financially first introduced by Satoshi Nakamoto in the mining of bitcoin in a paper in 2008. Bitcoin is the first digital money (crypto-currency) followed by Ethereum (public blockchain implementation) and other crypto-currencies. Blockchain is being used in various industries, sectors, and academics for accountancy as auditable records are cannot be changed and highly secure distributed ledger. Blockchain 1.0 (Digital Currency) is evolving to Blockchain 3.0 (Digital Society) through Blockchain 2.0 (Digital Economy i.e. Bitcoin 2.0 protocols, Bitcoin 2.0, Smart property, Smart Contracts, DAPPS). The Areas of implementation of blockchain technology in library are DRM (DRM helps copyright owners to maintain and control their content in digital medium), Plagiarism of articles, Interlibrary loans (interlibrary services), payments of journals and books to a publisher, scholarly publishing in various research fields.

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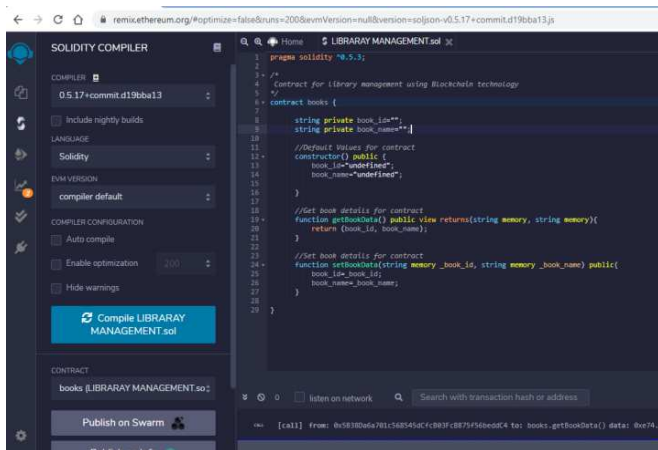
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## BLOCKCHAIN BASED LIBRARY MANAGEMENT

In the library automation based on RFID in KOHA with kiosk, the problem of auditing and stocktaking of books, papers, and periodicals persists. The solution to absolute transparency and immutability is blockchain-based library management systems. Library management can be done by the novel blockchain technology. To understand the purpose of the proposed proposal, consider Ram wanting to borrow books from "Library A" (LB\_A), and taking notes in Library B (LB\_B). LB\_A and LB\_B are working together through the system. LB\_A can recognize Ram's needs and claim his right to act without knowing Ram's exact identity. Hence, Ram can continue to borrow books in loan transactions stored in blocks.

A week later, Sam, who is registered with Library B (LB\_B), wants to borrow the same book that Ram currently has. Sam could contact Ram through the system and ask him if he could deliver the book to him without knowing Ram's exact identity. Ram no longer needs it, so he can use the system to execute block transactions and transfer the required loan to Sam. You can combine this by delivering Sam's books directly to Ram without returning them to the library. Thanks to the blockchain, the library staff, and the librarian can always check and find the current borrower of the issued book.



**Figure1: Contract for Library Management written in Remix IDE using solidity language**

The code for Smart Contract of library management system in Blockchain is provided in the below section. It has been written in Remix IDE using solidity language as shown in above Figure 1. This uses Solidity compiler version 5.0.3.

```
pragma solidity ^0.5.3;
```

```
/*Contract for library management using Blockchain technology*/
```

```
contract books {
```

```
    string private book_id="";
```

```
    string private book_name="";
```

```
    //Default Values for contract
```

```
    constructor() public {
```

```
        book_id="undefined";
```

```
        book_name="undefined";
```

```
    }
```

```
    //Get book details for contract
```

```
    function getBookData() public view returns(string memory, string memory){
```

```
        return (book_id, book_name);
```

```
    }
```

```
    //Set book details for contract
```

```
    function setBookData(string memory _book_id, string memory _book_name) public{
```

```
        book_id=_book_id;
```

```
        book_name=_book_name;
```

```
    }
```

```
}
```

The code has a constructor, two functions, and two variables for book ID and book name. It provides a basic structure for future complex and completes the implementation of a Blockchain-based library management system.

## CHARACTERIZATION OF BLOCKCHAIN BASED LIBRARY MANAGEMENT

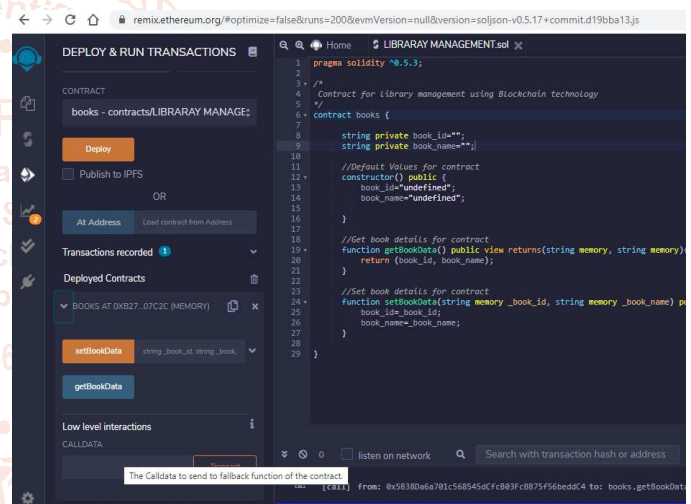
The use of library management services provides the library all the information about a book with one click. By storing books and accessing them through library management software, libraries can reduce their workload. All functions

within library could be computerized. For example, adding new books to the library, or students ordering or returning books from the library.

The characteristics of the library management system based on blockchain are listed in the below section.

Details of actions and members must be properly recorded.

1. The system should be easy-to-use and simple software.
2. You need to provide the information you need on time.
3. You need to provide order work to users. If there is no merchandise, you must allow users to place an order.
4. When a specific inventory is available, members must be notified on time. The system should be able to provide reports on demand.
5. The system should scan the entire library in seconds.
6. Branches should be divided by name as the author, publisher, genre, and so on.
7. You must provide access to the library and users.
8. The system is automated when it checks the due date of the leased resource and must calculate the final penalty correctly.



**Figure2: Contract for Library Management deployed on JavaScript VM**

The contract with its characteristics has been validated in the JavaScript VM environment as shown in Figure 2. It has designed to take book id and book name as input. The data are stored on the block. It could be fetched using the function "getBookData()". The idea of a basic Blockchain- based book data storage and retrieval mechanism has been validated in this paper.

## CONCLUSION

This paper has discussed Blockchain-Based Library Management that is depending on the Smart Contract for Library Management and is deployed on JavaScript VM of Remix IDE written in solidity language. Blockchain library management system restricts the use of copyright digital materials with errorless auditing of records of books. Hence, blockchain-based library is the genesis for the next-generation Library management system. Thus, blockchain-based library management is Library 2.0 technology.

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