IJIRSET
International Journal of Innovative Research in
SCIENCE | ENGINEERING | TECHNOLOGY

e-ISSN: 2319-8753 | p-ISSN: 2347-6710



INTERNATIONAL JOURNAL OF INNOVATIVE RESEARCH

IN SCIENCE | ENGINEERING | TECHNOLOGY

Volume 10, Issue 7, July 2021

ISSN INTERNATIONAL STANDARD SERIAL NUMBER INDIA

Impact Factor: 7.569

9940 572 462 | 6381 907 438 | ijirset@gmail.com | www.ijirset.com

International Journal of Innovative Research in Science, Engineering and Technology (IJIRSET)

| e-ISSN: 2319-8753, p-ISSN: 2347-6710| www.ijirset.com | Impact Factor: 7.569|

|| Volume 10, Issue 7, July 2021 ||

|DOI:10.15680/IJIRSET.2021.100333 |

Block Chain Based Document Management Systems in Information Security Age: Appraisal, Applications and Challenges

*[1]Gabriel O. Olatoyeand, *[2]Oluyinka I Omotosho

[1]Department of Computer Science, Ladoke Akintola University of Technology, Ogbomosho – Nigeria

[2]Department of Cyber Security Science, Ladoke Akintola University of Technology, Ogbomosho - Nigeria

*Corresponding Author: oiomotosho@lautech.edu.ng

ABSTRACT: In the modern era, with digitization splurge going on in all possible sectors the need for managing and utilizing the document is becoming more and more competitive and crucial. With the generation of a huge number of documents in the digital arena, there needs to be a secure platform wherein the sensitive data can be kept safe and secure. With many governments already having announced their digitization plans, documents like educational certificates, birth/death certificates, driving licenses, health records, employee service records, sale/deed property registration records, MOU/agreements and many similar sensitive documents will have to be stored with utmost security and safety. Also, the inefficiency and difficulty of information being stored as a hard copy of paper is being felt across organizations.The purpose of this paper is to identify the limitations of the current DMS Document Management System, to determine the potential of blockchain in improving the DMS and challenges towards blockchain-based DMS.

KEYWORDS: Blockchain technology, Document Management System, Block Chain Document, IPFS

I. INTRODUCTION

The use of updated information to support decision-making is one of the main challenges of several business processes. Information sharing in industry is made using many kinds of technology bases, but the most reliable form to evidence a business transaction, internal or external in offices, are documents. A document is everything that has been stored into an accessible source. Document Management System is an efficient, time saving and easy way to report,view and control the version of a file. The Business Dictionary defines document management as the control and coordination of all the processes involved in the flow of paper and electronic documents to ensure that the authorized personnel has a secure and efficient access to the documents whenever the need arises [3]. The processes involved in the flow of a document include document capture, storage, indexing, routing, distribution, and retrieval.

Information Technology and networks are changing the way professionals face many business processes, and, the use of electronic documents and office automation systems make us think how to evaluate the enterprise content management problems. Electronic Document Management Systems (EDM) are been used in several industry sectors, such as banks, manufacturing, pharmaceutical, insurance, engineering and others [5]. The EDM systems can be used from strategic levels to the operational ones. Construction document management is an essential component of the overall project management function [6]. Furthermore, the increased volume of document production, publication, and corporate-wide distribution through e-mail systems and workstation-based file managers has aggravated problems in document security, control, tracking, and retrieval [7].

Document

A document, as defined by the ISO 12651-2, is any recorded object or information that is considered a unit of data.It is easier to define documents starting with examples, generic documents can be illustrated by briefing notes, correspondence, e-mail messages, memorandums, spreadsheets, studies and so on [7]. According to Eleoranta et al. (2001) document is defined as everything that has been stored into an accessible source. Document can be found in many forms. Based on the definition above, texts, recorded sounds and images (of scanned papers or video-tapes) can

| e-ISSN: 2319-8753, p-ISSN: 2347-6710| www.ijirset.com | Impact Factor: 7.569|

|| Volume 10, Issue 7, July 2021 ||

|DOI:10.15680/IJIRSET.2021.100333 |

be documents. In construction industry some examples of documents are: drawings, design specifications, quality control reports, and others [6].

Document management

The term *document management* often refers to an overarching strategy for how a company stores, manages and tracks its electronic documents.Organizations and teams increasingly rely on document management in order to conduct business. They are producing content at an ever-increasing rate, and today's documents, now mostly digitized for more longevity. In the most basic terms, document management is how a company organizes, stores, tracks, and manages its documents in either paper or electronic format.Every company or organization hassome form of document management that involves capturing, Delivering, storing, and retrieving documents in its day to day operations. Thefour basic steps of Electronic Document Management Process is shown in Figure 1 [1].The problem is that the process is often time consuming for most organizations and hardly given the attention it deserves. This is why it is imperative to have an efficient document management system in place for a time-saving management of organization or company's documents. Most Today's document management systems rely on computer systems or cloud software to store and manage electronic documents.



Figure 1: Major Document Management Process

II. DOCUMENT MANAGEMENT SYSTEMS(DMS)

A document management system of is an automated business software solution used to organize, secure, store, capture, digitize, and tag business files [function-4]. They are used to capture and organize all types of documents into an electronic form that is easy to find and retrieve when needed[3]. Many document management systems extend beyond basic functionality to include document-related workflows. There are a ton of other add-ons, features and capabilities touted by some document management systemswhich has led to other names and designations like enterprise content management (ECM), enterprise information management (EIM) and intelligent information management (IIM).

A document management system is used to automatically organize, secure, digitize and classify company documents, making them easy to access, edit and share. Originally, document management systems were borne as companies sought to shift operations away from a paper-based office, with manila folders and filing cabinets. Since then, document management has taken on a more central role in the enterprise tech stack, facilitating workflows and bridging disparate repositories into a central hub.

Functionality of Document Management System

In its most basic definition, a document management system should at least do those three things well. These include the following;

i. *Capture Documents from any Source*
   A document management system should have a way to input documents and files from varied sources. Some sources might include Scan, capture and digitize from paper files, Emails and attachments, External applications like CRM or ERP and User-generated content saved natively to the document management system. Once documents are loaded into the DMS from whichever source, the DMS should feature a way to index and classify those documents, often with metadata.
ii. *Serve as a Central Repository*
   A basic function of a document management system is to serve as the hub the central repository for company files. Many basic DMS require a massive migration project to move all business-critical documents into the system. More advanced intelligent information management solutions like M-Files connect to existing

| e-ISSN: 2319-8753, p-ISSN: 2347-6710| www.ijirset.com | Impact Factor: 7.569|

|| Volume 10, Issue 7, July 2021 ||

|DOI:10.15680/IJIRSET.2021.100333 |

repositories, applying metadata and relationships to documents stored in other systems. With integrations, there's no need for migration and the environments of other systems can remain undisturbed [15].

iii. *Facilitate Document Search and Retrieval*

A document management system should make information easy to find for users. With metadata, all files are tagged so that they can be found by a multitude of parameters. For example, metadata for an invoice might be tagged with Parties to the invoice, important dates, Amount, Business unit or department and Description of services rendered, or products purchased. With all of that information attached to the document's metadata, searches yield better results and users can retrieve documents faster and simpler. In M-Files, documents can be found using a Google-like search, which returns the most relevant files first [15].

Classification of DMS

Document Management Systems are majorly Classified by Cloud vs. On-Premises and Folder-Based vs. Folderless Document Management System. Cloud-based document management systems store files in the cloud, making them accessible anywhere there's an internet connection. While in contrast, some organizations may require on-premises document management, where files are stored on a local server. This may be necessary when certain regulations mandate local storage or when certain countries require data sovereignty, for example.A hybrid DMS allows for a combination of both options.

Some document management systems are folder-based, simply using traditional file structures of folders and sub-folders within the system. Other systems are folderless, metadata-based and repository-agnostic like M-Files. In this type of system, it doesn't matter where a document is stored. The only thing that matters is what the document is, which is a function of metadata.

Main Features of Document Management System

Some key features to explore in a DMS include:15]

*Search***:** An effective DMS helps users find documents and information based on document identifiers, metadata, relationships and content.

*Version control***:** Version control features ensure access to the latest version of a document. Version control and tracking make it easy to see what has changed, who did it and when the change was made.

*Regulatory compliance support***:** a document management system can help reduce the risk of non-compliance. Users can automate audit trails and manage information and related workflows in accordance with compliance regulations.

Metadata: 93% of workers are unable to find a document because it has been poorly named or filed. In a DMS, because information is tagged with metadata based on what it is, the same information can be searched for and found using different criteria depending on the use case. Unique information appears dynamically where it is needed without duplication.

Integrations: Many document management systems integrate with other business systems and repositories; email, network folders, CRM, ERP, legacy ECM and others.

Scalability: When selecting a document management system, a company should pay attention to the scalability of that system. Looking beyond current needs, find a DMS that has advanced features that accommodate business growth or change.

Security: A DMS should provide robust security features like access permission and control features, audit trails, federated authentication, enterprise file encryption in transit and at rest, intrusion detection, data loss prevention, high availability and more.

Usability: Since a DMS becomes core technology for the business, it's important that the user experience is a great one, with easy accessibility, little to no downtime and simple-to-use features. Employees should be able to easily access, manage and navigate files.

Collaboration: A DMS should make it simple for users to share and collaborate on documents — with features like project document management, task tracking, workflows, co-authoring and easy sharing of documents between users.

Content intelligence: Some advanced document management systems employ artificial intelligence. Artificial intelligence can help classify documents by populating metadata fields, scan files for certain data and separate business-critical data from clutter.

| e-ISSN: 2319-8753, p-ISSN: 2347-6710| www.ijirset.com | Impact Factor: 7.569|

|| Volume 10, Issue 7, July 2021 ||

|DOI:10.15680/IJIRSET.2021.100333 |

Workflows: Manually managing day-to-day processes isn't a good use of time. A DMS with workflow automation helps ensure consistency by verifying that every step in a business process is followed. Automated workflows streamline common business processes — like contract approvals, controlled content, and invoicing — sending a notification when there's a task to be handled.

Remote Work: A cloud-based DMS allows users to access files from anywhere and often from any device enabling remote work anywhere: at the office, home, airport, hotel, coffee shop… anywhere [15].

Benefits of Using a Document Management System?

A DMS should make work easier, more productive, and more efficient, saving staff hours of tedious tasks and the exasperation of not finding the documents they need quickly. Main benefits include the following:

Increased Productivity: When workers spend less time searching for documents or tending to manual, repetitive tasks, they have more time to dedicate to value-adding work.

Decreased Security Risk: Keeping information secure and applying dynamic access controls reduces information security risk and exposure. In the event of an unforeseen fire or flood, disaster recovery is simple when documents are stored in the cloud.

Improved Compliance Measures: Compliance requirements for many business documents can be complicated and challenging. A DMS helps organizations avoid fines, revoked licenses or even criminal liability by automating key documents to meet regulatory requirements.

Fast and Easy Document Search: Workers spend an average of 18 minutes searching for a document, according to Forrester. A metadata-based DMS makes it quick and easy to find just the right document.

Enhanced Collaboration: A DMS makes sharing information and collaborating easy, allowing documents from different sources to be accessible from multiple locations. Users can share documents, monitor workflows, co-author documents and more [15].

DMS Software for managing documents efficiently includes; PaperSave, ClickUp, Templafy,M-Files, Bit.AI, Alfresco, DocuWare, XaitPorter, OnlyOffice, Google Drive and LogicalDoc (SoftTesting) [16].

However, there are still some limitations in DMS in the common data environment which can be improved with the integration of blockchain technology. The purpose of this paper is to identify the limitations of the current DMS, to determine the potential of blockchain in improving the DMS and challenges towards blockchain-based DMS [13].

Current DMS system possessed limitations such as system maturity, high cost, slow adoption of technology and security concerns. Blockchain is able to make improvements in the current EDM system in terms of data integrity, data tracking, data immutability, data security, data trustability, and data accountability. Several challenges such as costs, blockchain scalability and industry knowledge, industry culture and hardware need to overcome prior blockchain-basedDMS systems can be widely applied [13].

III. BLOCKCHAIN BASED DOCUMENT MANAGEMENT SYSTEM

Blockchain can be described as a data structure that holds transactional records, while ensuring security, transparency, and decentralization. Blockchain is a decentralised or distributed ledger that is completely open to anyone and everyone on the network. Once an information is stored on a blockchain, it is extremely difficult to change or alter it.Currently, the whole world is moving towards digitization in every aspect, blockchain is perhaps the most apt and significant technology for eliminating the issues associated with the management and storage of documents and other records. It has already presented a wonderful platform for the financial sector, education sector and government bodies to keep sensitive data safe and secure. This platforms will enable business and government to store and manage sensitive document (emerald) [13].

Blockchainin Documents

A blockchain document is a type of document that is stored on a blockchain network. A blockchain is a decentralized, distributed ledger technology that allows multiple parties to store and share information in a secure and tamper-proof way. In the case of a blockchain document, the document is typically broken down into small digital "blocks" that are then recorded on the blockchain network.Each block contains a unique digital signature that is linked to the previous

| e-ISSN: 2319-8753, p-ISSN: 2347-6710| www.ijirset.com | Impact Factor: 7.569|

|| Volume 10, Issue 7, July 2021 ||

|DOI:10.15680/IJIRSET.2021.100333 |

block in the chain, creating an immutable and transparent record of all the changes that have been made to the document. This ensures that the document cannot be altered or deleted without leaving a clear trail of evidence.
Blockchain documents can be used for a variety of purposes, such as recording legal contracts, financial transactions, or even personal identity information. They provide a secure and transparent way to store and share sensitive information, and can help to reduce the risk of fraud, hacking, or other forms of data tampering.
Some of the blockchain applications that are majorly used by for storing, securing, and sharing documents include Cipher, OriginStamp, BurstIQ, KYC-Chain, SkuChain, Chainyard, Block Array and State of Delaware's blockchain initiative[16].

Block Chain technology and information security
Confidentiality, Integrity and Availability (CIA) are the basic aspects of Information Security [11].The confidentiality aspect concerns all access restrictions to information and resources, secrecy and privacy. With secrecy, it means to limit the amount of people having access to the information and privacy is the ability to protect personal secrets[11]. How much data can be trusted or the trustworthiness of data and resources is the aspect of integrity. It can be divided into data integrity, that is the integrity of the contents, and origin integrity, the source of the data is correct, which is also called authentication. Integrity violations can either be prevented or detected.The ability to access information or a resource is referred to availability. A service can deliberately be blocked by an attacker, referredto denial of service attacks, or DOSAttacks for short, which can be difficult to identify and separated from increased normal usage [11].

Even though there are many document management sustenance currently prevailing in the market, not all of them can provide required transparency, security and efficiency. The advantage with blockchain is that the document once added cannot be deleted or the order be changed as the system allows only appending. Moreover blockchain can also allow the validation of temporal existence, authenticity and non-repudiation of the documents [13].

As a major challenge, blockchain is characterized by storage issue. Since, blockchain databases are stored on all network nodes, the more the number of transactions increases, the more storage is required. Hence, People useBlockchain to store in documents+, the documents are of worthy involving value. E.g., will document, lease document, property inheritance document, agreement document, etc. It can be used in any Industry. But generally it's not advisable to keep documents in blockchain as it is unnecessary. In the sense that large docs add up space and every node on blockchain has to download all the documents which increases cost. So in general scenario, documents are generally kept in Interplanetary File System[14].IPFS is a file sharing system that can be leveraged to more efficiently store and share large files. It relies on cryptographic hashes that can easily be stored on a blockchain [17].

IV. INTERPLANETARY FILE SYSTEM (IPFS)

it is basically a file-sharing system that can be leveraged to more efficiently store and share large files. Though, it allows files storage and track edits over a network, it is not exactly a blockchain.IPFS can be rightly called the Hard drive for blockchain. It is a storage system that facilitates direct interaction within a secure and global peer-to-peer network, as in blockchain. Thus, it enables something like a new web.It was introduced in 2016, and allows users to share files and information without barriers. The most unique thing is, that unlike many technologies the IPFS system works best with large files that need a higher bandwidth.Another reason for its popularity is because it is designed to operate over a multitude of protocols like FTP and HTTPS. It stores data using a distributed hash table, once the hash is obtained, we ask the peer network for the user who has the content located in that hash, and we download directly from the node that has the required data.This mechanism increases security and creates a good control system. In this system, only those with the hash can access the content[18].

IPFS and Blockchain
Blockchain is a decentralized peer-to-peer network that provides immutability and thus, is the best choice to support traceability of data on a distributed file system like IPFS.IPFS and blockchains share a similar structure and work well together. To understand it well, imagine it like IPFS would connect all different blockchain quite like how the internet connects all websites. It might as well act like a backbone structure for the new web. Like we link one page to another using a **link,** a link can be placed in Ethereum in order to link to some other network.Hence, the future of IPFS and blockchain is quite closely related and they might be integrated to generate a consolidated engine of decentralised finance and applications [18].

| e-ISSN: 2319-8753, p-ISSN: 2347-6710| www.ijirset.com | Impact Factor: 7.569|

|| Volume 10, Issue 7, July 2021 ||

|DOI:10.15680/IJIRSET.2021.100333 |

Uses of IPFS includes;

1. Archivists: With IPFS, you can store archival data with deduplication, c lustered persistence, and high performance – enabling future generations to access the world's information.
2. Service Providers: Due to its use of peer-to-peer content delivery, IPFS can help you reduce bandwidth costs.
3. Researchers: Using IPFS to store large datasets can improve performance and enable decentralised archiving when you use them for distributing or working with large datasets.
4. Blockchain Developers: It allows you to store large files off-chain and create immutable, permanent links in transactions, securing and timestamping content without having to store it on-chain.
5. Content Creators: IPFS gives creators the tools to build and share on the decentralised web-like minting NFTs or delivering free content.
6. Offline Users: Poor internet infrastructure is hampered by high-latency networks. Peer-to-peer IPFS offers resilient access to data independent of latency or backbone connectivity.

Advantages of IPFS

1. No need for servers to host websites. The data will be directly delivered by IPFS and pulled from the blockchain
2. Safe social networks as the information will be available to only those whom you give the permission
3. Uncensored communication without any intermediaries
4. No more account registration! Your private keys will be the only account needed as an identity for websites.

Who is using IPFS?

1. Microsoft ION: It is a digital identity system built on Bitcoin and IPFS. It allows the creation of a secure digital identity system that can work globally.
2. Wikipedia uso IPFS: It is exactly like the main wikipedia website with permission to access wikipedia from areas where it is censored.
3. Filecoin: Cooperative storage cloud that operates on IPFS
4. Opera Para Android: allows mobile users to access data on the IPFS network.
5. Brave: A unique search engine that uses IPFS to host the decentralised store.

V. CONCLUSION

In this Paper, Functionalities of Electronic Document Management System and associated Weakenesses is identified. Blockachain was prescribed as Antidote to this weaknesses, while its inhererentlimitating factor in acting as an all-round Data Management System was discussed. The Interpalnary File Sytem is however recommend to extend the storage demand and capability to Blockachain. This was followed by a discussion on how IPFS can be useful and what advantages it has to offer.

REFERENCES

[1] Document Management on Blockchain. https://futuristiqsolutions.com/document-management-on-blockchain/

[2] X. Zhao *et al*., "Blockchain Technology Based Digital Document Management System Design," *2022 7th Asia Conference on Power and Electrical Engineering (ACPEE)*, Hangzhou, China, 2022, pp. 440-446, doi: 10.1109/ACPEE53904.2022.9783819.

[3] What is Document Management? https://www.folderit.com/blog/what-is-document-management/

[4] Kiu, M.S., Lai, K.W., Chia, F.C. and Wong, P.F. (2022), "Blockchain integration into electronic document management (EDM) system in construction common data environment", *Smart and Sustainable Built Environment*, Vol. ahead-of-print No. ahead-of-print. https://doi.org/10.1108/SASBE-12-2021-0231

[5] Joia, L.A. (1998) "Large-scale Reengineering in Project Documentation and Workflow at Engineering Consultancy Companies". International Journal of Information Management, Pergamon, 18, (3) pp. 215-224.

[6] Hajjar, D., AbouRizk, S. M. (2000). "Integrating Document Management with Project and Company Data". Journal of Computing in Civil Engineering, ASCE, 14 (1), pp. 70-77.

[7] Sutton, M.J.D. (1996) "Document Management for the Enterprise: principles, techniques and applications". John Wiley & Sons: New York, NY, 369p.

[8] Eleoranta, E., Hameri, A., Lati, M. (2001) "Improved Project Management through Improved Document Management". Computers in Industry, Elsevier, 45, pp. 231-243.

| e-ISSN: 2319-8753, p-ISSN: 2347-6710| www.ijirset.com | Impact Factor: 7.569|

|| Volume 10, Issue 7, July 2021 ||

|DOI:10.15680/IJIRSET.2021.100333 |

[9] Leikums T., "a study on electronic document management system integration needs in public sector," International Journal of Advances in Engineering & Technology, vol. 5, no. 1, pp. 194-205, 2012.

[10] 10 BEST Document Management Software In 2023.https://www.softwaretestinghelp.com/document-management-software/

[11] Bishop, M. (2003): Computer Security Art and Science. First edn. Addison Wesley. RESEARCH-ARTICLE. April 2020. Published By ACM

[12] What Document Management System and Why is Useful. https://www.function-4.com/blog?p=what-is-a-document-management-system-and-why-is-it-useful-210324

[13] Kiu, M.S., Lai, K.W., Chia, F.C. and Wong, P.F. (2022), "Blockchain integration into electronic document management (EDM) system in construction common data environment", *Smart and Sustainable Built Environment*, Vol. ahead-of-print No. ahead-of-print. https://doi.org/10.1108/SASBE-12-2021-0231

[14] Deepak Guru. How can I apply blockchain technology to documents?https://www.quora.com/What-is-a-blockchain-document

[15] Garrett Hollander. (2021) What is a Document Management System? And Why is it Useful https://www.function-4.com/blog?p=what-is-a-document-management-system-and-why-is-it-useful-210324

[16] Top 8 Blockchain Applications for Documents You Need to Know. https://originstamp.com/blog/top-8-blockchain-applications-for-documents/

[17] M. Steichen, B. Fiz, R. Norvill, W. Shbair and R. State, "Blockchain-Based, Decentralized Access Control for IPFS," *2018 IEEE International Conference on Internet of Things (iThings) and IEEE Green Computing and Communications (GreenCom) and IEEE Cyber, Physical and Social Computing (CPSCom) and IEEE Smart, Data (SmartData)*, Halifax, NS, Canada, 2018, pp. 1499-1506, doi: 10.1109/Cybermatics_2018.2018.00253.

[18] How to Share File in IPFS Blockchain | IPFS Tutorial. https://data-flair.training/blogs/ipfs-blockchain/



INNO SPACE
SJIF Scientific Journal Impact Factor

Impact Factor:
7.569

doi cross ref

ISSN INTERNATIONAL STANDARD SERIAL NUMBER INDIA

निस्केयर NISCAIR

INTERNATIONAL JOURNAL OF INNOVATIVE RESEARCH

IN SCIENCE | ENGINEERING | TECHNOLOGY

9940 572 462 6381 907 438 ijirset@gmail.com

www.ijirset.com

Scan to save the contact details