

# Data Vaults for Blockchain Accounting Information Systems

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**Abstract:** Blockchain technology specifically designed for crypto currency, blockchain was not intended to be used in other domains. However, during the past few years, critics argued that Blockchain has the potential to deal with some unique requirements like confidentiality and immutability and can therefore be deployed in several areas other than cryptocurrency. The use of Blockchain to support Accounting Information Systems (AIS) through enterprise resource planning (ERP). This Project demonstrates the application of a simple and lean version of Blockchain to assist enterprises in storing their financial and accounting data into data vaults, ensuring their data integrity. In this research, a hybrid solution is proposed to ensure AIS data integrity against any deliberate attempt or mala-fide intention for alteration or deletion from the database that can be verified at any later stage. Since Blockchain can be used to prevent any mutability in the stored data, the proposed solution presents a concept of Data Vaults backed by the Blockchain.

**Index Terms:** AIS, blockchain, crypto currency, data vaults, ERP, cryptographic primitives, SHA256.

## INTRODUCTION

Data is an integral part of an accounting information system (i.e., AIS); therefore, it requires special consideration while dealing and handling, and data stores in the DB are secure and safe but to a certain extent. The data may be compromised, where at least one person with unrestricted access can manipulate the data as per her will or the company requirements. Therefore, a computer-based system should be proposed for companies to save their financial information on a location other than their systems. Such systems can ensure that the auditors and financial regulatory authorities can ensure that the data are authentic, tamper-proof, and there would be no data alteration in the future as a replica or true copy is available and saved in the Data Vault. Traditional databases (i.e., DBs) are used to store the data, but data integrity is never out of the question. DBs are not as efficient as the Blockchain is. Blockchain has essential features, which ensure the integrity of data and stop unwanted mutability. Luckily, data vaults apply similar concepts. However, storing data using Blockchain is quite complex, and the process is often difficult to understand. When Blockchain is applied in crypto currency, its complexity increases many folds, which restrain many developers and researchers from initiating any work in the Blockchain domain.

## Objective

Human errors cannot be avoided entirely but can be minimized to a certain extent by applying different input validation mechanisms. Moreover, input data can be checked and verified at different levels in the management hierarchy before it is available to add to AIS. Our Project aims to achieve data integrity in AIS. If the data have been altered, we seek to identify that particular change and check the authenticity of data produced by a company for financial regulatory authorities, auditors, or concerned third parties.

## LITERATURE SURVEY

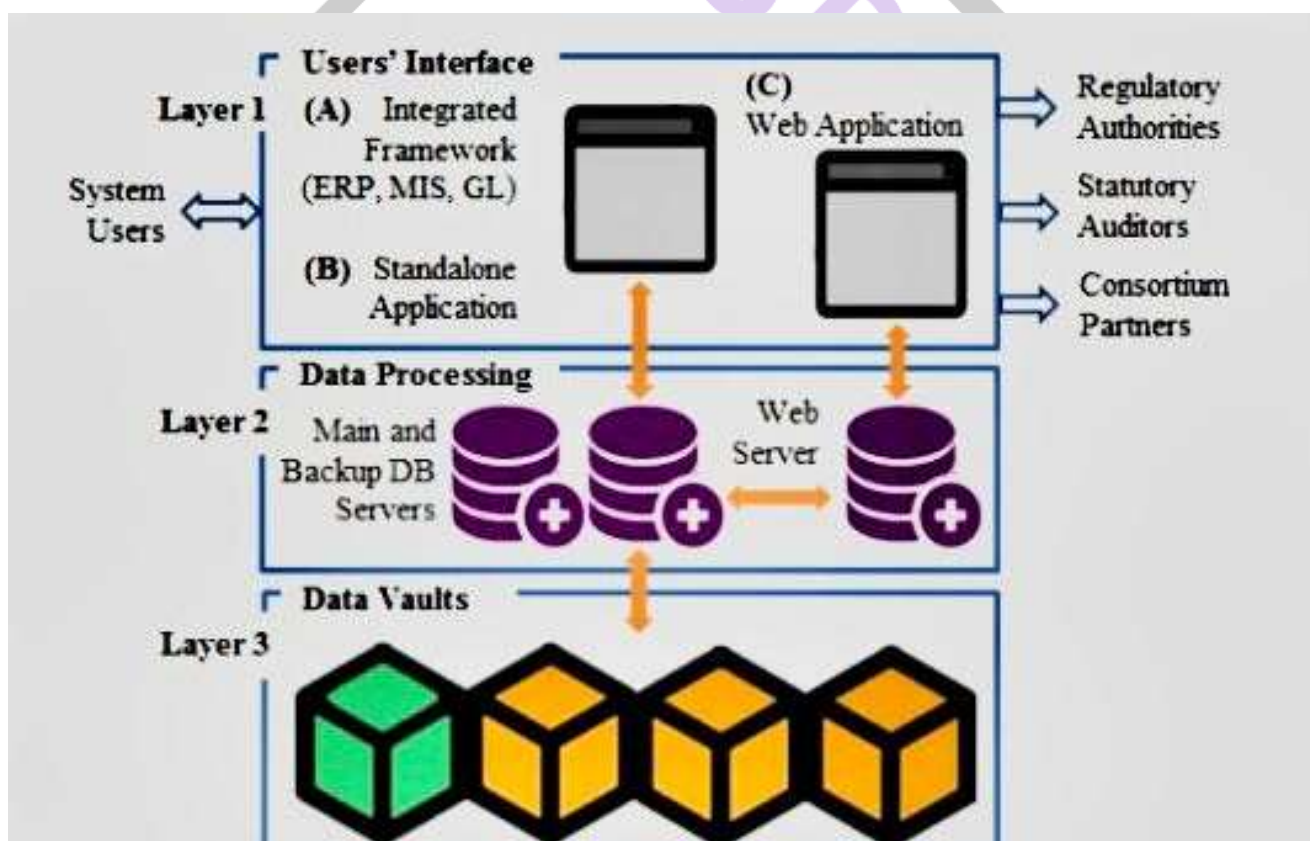
In this paper, H. Daoud. And M. Triki., “Accounting information systems in an ERP environment and Tunisian firm performance,” said that this System focuses on ERP system adoption has largely marked the evolution of accounting information systems (AISs). Modern AISs have great potential to influence business performance. The purpose of this study is to examine the influence of the accounting information system in an ERP environment on firm performance. We investigate the direct effects of top management involvement and external expertise on the AIS. We also examine the interaction effect of accounting staff competency with the AIS and test its impact on firm performance improvement. We conduct an empirical study of 102 Tunisian firms adopting ERP systems. We use the partial least square (PLS) approach for hypothesis testing. The results indicate that top management involvement and external expertise have an impact on the AIS. Furthermore, they show that the accounting techniques used after ERP system adoption influence firm performance. The interaction effect of accounting staff competency with the AIS has a positive impact on firm performance improvement.

J. M. McComb and S. W. Smalt, J. Finance Accounting in this paper titled “The rise of blockchain technology and its potential for improving the quality of accounting information”, The recent rapid growth of blockchain technology is currently revolutionizing crypto currencies, monetary transfers, asset tracking, contract execution, and trust relationships. This paper attempts to discuss the origin of blockchain technology, current uses, and potential applications that can possibly strengthen the timeliness, quality, and accuracy of accounting information. The paper will also examine the efficacy of several practical accounting applications.

In this paper “The impact of blockchain technology on financial technology (FinTech)” Author M. Al-Essa said FinTech (Financial Technology) and Blockchain are prevalent topics among technology leaders in finance today. This article describes the impact and revolution of FinTech and Blockchain in the financial industry and demonstrates the main characteristics of such technology. Then, we present three critical challenges as well as three ethical issues about using Blockchain technology. Next, we discuss the development of Blockchain for the financial sector. In addition, we describe the real motivations for banks to explore Blockchain, and problems they face. In order to have a good understanding of the industry, a qualitative method was adopted, and sixteen experts were interviewed. It was identified that knowledge hiding in Blockchain was common and the rationale behind it was analyzed using the TPB (Theory of Planned Behavior) approach. The analysis results suggested that knowledge hiding was due to affective, behavioral and cognitive evaluations. The interviewees also provided several recommendations and success factors to overcome current issues in Blockchain adoption. Therefore, four important propositions have been developed. Finally, this article suggests how financial services should respond to this new technology and how to manage knowledge sharing in a more structured way. This article contributes to the literature related to the current entrepreneurial finance landscape for Blockchain.

In this paper B. S. Tan and K. Y. Low, “Blockchain as the database engine in the accounting system,” This paper examines the prediction that blockchain technology will transform accounting and the profession because transactions recorded on a blockchain can be aggregated into financial statements and confirmed as true and accurate. We argue that blockchain technology affects the database engine of the accounting information system (AIS) through digitisation of the current paper-based validation process. In a blockchain-based AIS, accountants will no longer be the central authority but will remain the preparer of financial reports required by regulations; they will continue to influence policies such as the choice and accreditation of validators and serve as validators of last resort. Audit evidence still needs to be gathered for rendering of an audit opinion in a blockchain-based AIS PROPOSED SYSTEM

An accounting information system (AIS) is a structure that a business uses to collect, store, manage, process, retrieve, and report its financial data so it can be used by accountants, consultants, business analysts, managers, chief financial officers (CFOs), auditors, regulators, and tax agencies. Specially trained accountants work in-depth with AIS to ensure the highest level of accuracy in a company's financial transactions and record-keeping, as well as make financial data easily available to those who legitimately need access to it—all while keeping data intact and secure.



Design description of the proposed system

## 1) LAYER 1 - USER INTERFACE

There are three types of user interfaces available through which the consortium company, regulatory authorities, auditors, or any partner company can interact with the system for data inputs and verification, as follows. An Integrated Framework: a framework is integrated with the AIS or ERP system, and a user interface is available within the system. The ERPs or other financial application developers integrate an executable programming code in their system. After the data rearrangement, the framework would directly

interact with the database to extract the trial balance and send it onward to Data Vaults.

## 2) LAYER 2 – DATA PROCESSING

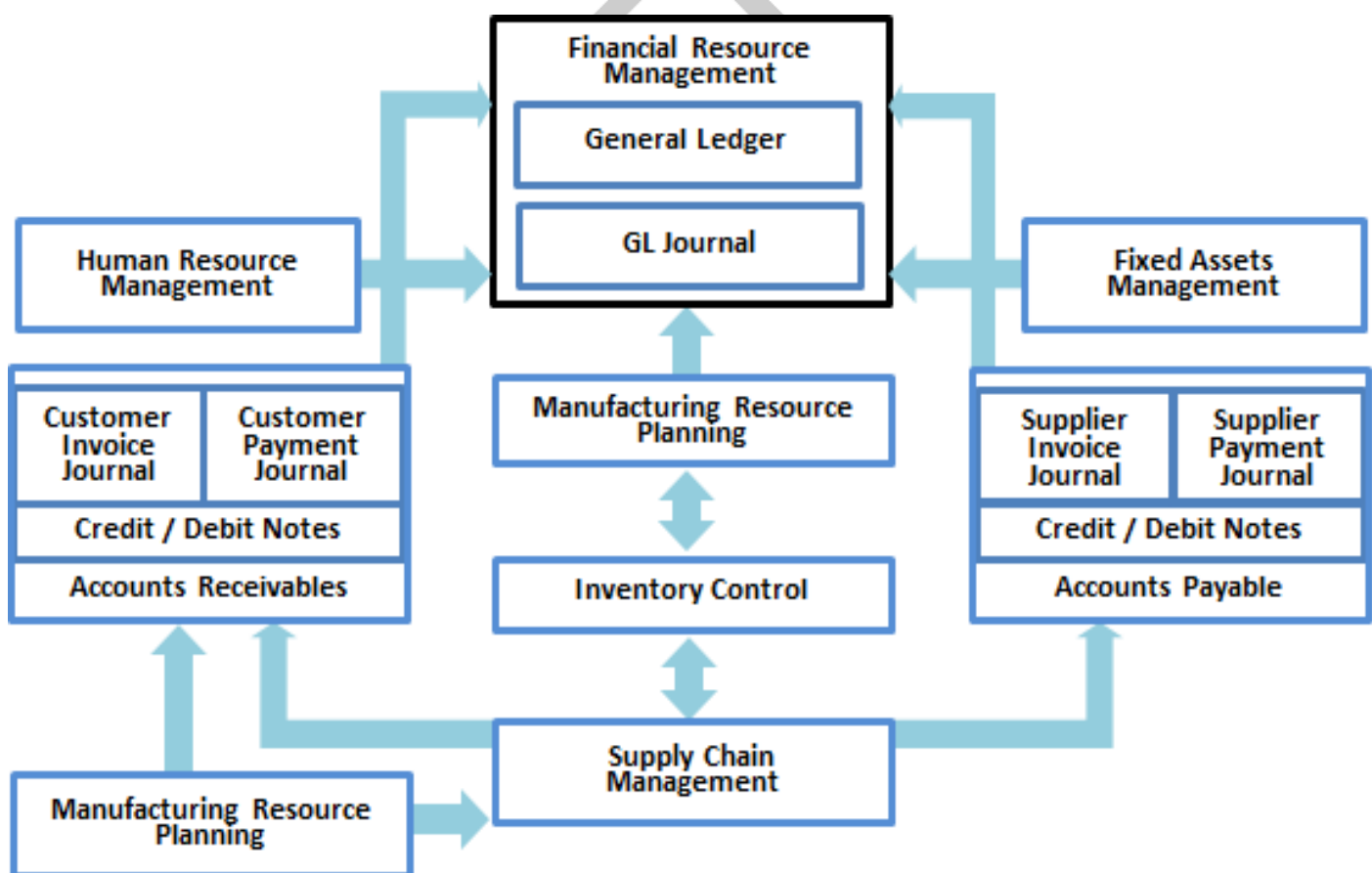
The second layer is the central part of the solution, which processes the received data from Layer 1. The information received in this layer is stored in a database that includes the trial balance and other information. The routine processes the data and makes it available for a block, creates a block for data, inserts the processed data into the block, and then chains it into the Blockchain. All essential functions are done in this layer, including the generation of hash values.

## 3) LAYER 3 – DATA VAULTS

After processing the data in the second layer, the block is now ready for broadcasting to different nodes on network locations to become part of a chain of blocks. Now, the data is saved in digital Data Vaults. It is assumed that a P2P network is already established, nodes are identified and connected to the super-node or main server. Creating or establishing a decentralized network is out of the scope of this research work.

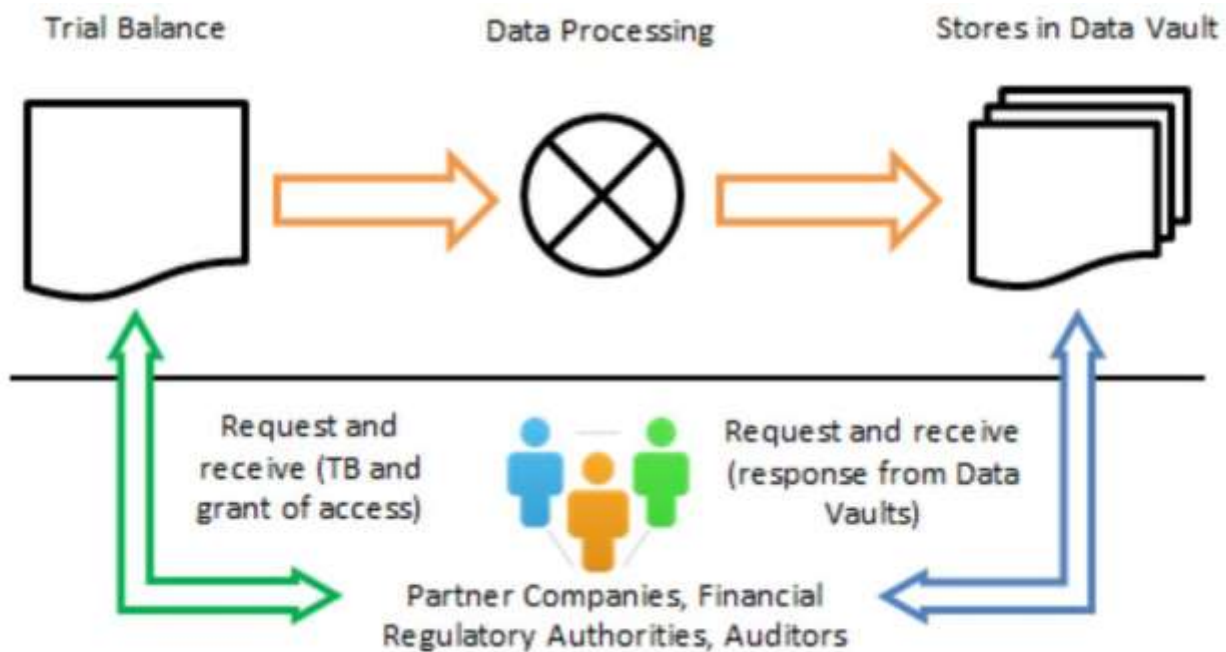
## BLOCK DIAGRAM

Process flow of AIS in a typical IT-based system.



## Accounting Information System(AIS)

AIS refers to a structure used by businesses to collect, store, manage, process, and retrieve financial information of the organization. AIS considers accounting as an essential part of an organization. The input of AIS takes the form of business activities-related data, and the output is generated as financial reports. Such financial reports are essential to make decisions and analyze business outcomes; these reports can be shared by auditors, financial experts, and financial regulatory authorities. Modern AIS is a computer-based system that uses software and hardware for bookkeeping and is administered by qualified accountants. Book keeping and is administered by qualified accountants. Internal and external users use the conceptual model of an AIS within an organization. The purpose of the AIS is to process and generate financial and non-financial reports. The management accounting process constitutes three main steps, including transactions, reports, and decision making. AIS systems combine hardware and software resources and work through joint modules connected to a central DB. An effective AIS system prevents users from making mistakes, processes data quickly, and produces insightful reports. Traditional accounting practices, like Generally Accepted Accounting Principles (GAAP), are preliminarily flexibly embedded into the systems to be customized and replaced as per the requirements and needs of the companies. Figure shows the process flow of AIS in an IT-enabled environment.



**Conceptual model of our data integrity solution.**

## Algorithms

### 1) Elliptic Curve Cryptography (ECC)

The Elliptic Curve Cryptography (ECC) is modern family of public-key cryptosystems, which is based on the algebraic structures of the elliptic curves over finite fields and on the difficulty of the Elliptic Curve Discrete Logarithm Problem (ECDLP). ECC implements all major capabilities of the asymmetric cryptosystems: encryption, signatures and key exchange. The ECC cryptography is considered a natural modern successor of the RSA cryptosystem, because ECC uses smaller keys and signatures than RSA for the same level of security and provides very fast key generation, fast key agreement and fast signatures. The key generation in the ECC cryptography is as simple as securely generating a random integer in a certain range, so it is extremely fast. Any number within the range is a valid ECC private key. ECC crypto algorithms can use different underlying elliptic curves. Different curves provide different levels of security (cryptographic strength), different performance (speed) and different key length, and also may involve different algorithms. The technology can be used in conjunction with most public key encryption methods, such as RSA, and Diffie-Hellman.

### 2) The Diffie-Hellman (DH)

The Diffie-Hellman (DH) Algorithm is a key-exchange protocol that enables two parties communicating over a public channel to establish a mutual secret without it being transmitted over the Internet. DH enables the two to use a public key to encrypt and decrypt their conversation or data using symmetric cryptography. DH is generally explained by two sample parties, Alice and Bob, initiating a dialogue. Each has a piece of information they want to share, while preserving its secrecy. To do that they agree on a public piece of benign information that will be mixed with their privileged information as it travels over an insecure channel. Their secrets are mixed with the public information, or public key, and as the secrets are exchanged the information they want to share is commingled with the common secret. As they decipher the other's message, they can extract the public information and with knowledge of their own secret, deduce the new information that was carried along. While seemingly uncomplicated in this method's description, when long number strings are used for private and public keys, decryption by an outside party trying to eavesdrop is mathematically infeasible even with considerable resources. DH is one of the first practical implementations of public-key cryptography (PKC). It was published in 1976 by Whitfield Diffie and Martin Hellman. Other contributors who are credited with developing DH include Ralph Merkle and researchers within the United Kingdom's intelligence services (c. 1969).

## CONCLUSION

In this research, we introduced a solution that can assist enterprises in saving their financial data in Blockchain, or so-called Data Vaults, and we have selected the trial balance for implementation purposes. The proposed framework can ensure data integrity in AIS or ERP systems, and if at any stage, the data is compromised, with the help of the proposed system, breaches can be identified immediately.



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