

Secure Framework for Government Tender Allocation

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Abstract

Governments and public sector entities worldwide are actively seeking innovative strategies to adapt to rapid technological progress, aiming to enhance governance effectiveness, streamline work processes, and optimize expenditure. Blockchain technology stands out as a prime example, captivating the interest of governments globally in recent years. Its ability to offer heightened security, enhanced traceability, and cost-efficient infrastructure positions blockchain as a versatile solution applicable across diverse sectors. Typically, governments engage third-party organizations through tender processes for various projects. However, these processes are often marred by competitors attempting to gain unfair advantages by eavesdropping on tender values, while corrupt officials may solicit bribes to favor specific parties. In response, we propose a robust and transparent framework for government tenders leveraging blockchain technology. By utilizing blockchain as a secure and immutable data structure, susceptible government records are safeguarded against tampering. This initiative aims to establish a transparent and secure edge computing infrastructure for tender workflows, minimizing the need for extensive human oversight. Blockchain techniques are employed within various security service models, serving as a backend database with a distributed ledger maintained using the SHA 256 Algorithm. Users from different departments can register and submit quotations, with administrators responsible for evaluating responses and ensuring adherence to experience and process management standards for comprehensive auditing.

Keywords: Smart contract, distributed system, decentralized, edge computing, proof-of-work, block chain, Ethereum

INTRODUCTION

In this endeavor, our primary objective is to tackle prevalent issues by constructing a transparent and secure edge computing infrastructure tailored for government tender allocation. This innovative approach not only removes the necessity for human oversight but also facilitates seamless tracking and updating of governmental policies over time [1]. Beyond the risks of data breaches, the pervasive challenges of bribery and procedural delays are hindering governmental processes. Government officials frequently abuse their authority, demanding exorbitant bribes to expedite tender approvals. To combat these adversities, our proposed framework advocates for the adoption of blockchain technology, thereby establishing a decentralized system to streamline government tendering processes. By leveraging blockchain, these processes become inherently transparent, auditable, and immutable, fostering efficiency and trust [2].

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Government tender allocation encompasses the solicitation of bids from suppliers or contractors for providing goods, services, or works to the

government. This process is pivotal for public procurement, ensuring the efficient utilization of taxpayer funds. However, conventional tender allocation methods encounter numerous challenges, undermining their efficacy and integrity [3]:

- *Lack of Transparency*: Conventional tender procedures often lack transparency, impeding stakeholders' ability to monitor fund allocation and ensure equitable treatment.
- *Fraud and Corruption*: Manual handling of tender documents and centralized decision-making structures render tender processes susceptible to fraudulent activities and corruption.
- *Lengthy Processing Times*: Paper-based tender procedures are time-intensive, leading to project delays and escalated costs.
- *Limited Accessibility*: Traditional tender processes may not be easily accessible to all stakeholders, particularly smaller vendors or contractors, restricting competition.

OBJECTIVE

In recent years, blockchain technology has emerged as a transformative force, offering decentralized and immutable solutions across various sectors. One particularly promising application of blockchain is in government tender allocation. Government tenders involve significant public funds and are subject to scrutiny regarding transparency, fairness, and security [4]. Traditional tender allocation processes often suffer from inefficiencies, fraud, and corruption, eroding trust among stakeholders. However, by harnessing blockchain technology, governments can establish a secure framework for tender allocation, enhancing transparency, accountability, and trust in the process. Countries such as Georgia, the UK, UAE, Australia, China, Japan, and Russia are making rapid strides in integrating blockchain into their daily operations. The inherent features of blockchain, including immutability, transparency, and decentralized consensus, offer solutions to many challenges associated with traditional tender allocation methods [5]. This study delves into the potential of blockchain technology to revolutionize government tender allocation processes, ensuring integrity, fairness, and efficiency in public procurement. Smart contracts emerge as a promising tool to mitigate corruption and bribery in government workflows, significantly reducing service completion times and introducing new services while enhancing the Quality of Service (QoS) for citizens. Although existing electronic services and IT infrastructure face limitations, emerging technologies like blockchain have the potential to significantly mitigate these issues [6]. A permissioned blockchain network can provide the necessary transparency to effectively implement government policies for the benefit of citizens, while also assigning responsibilities in cases of system abuse.

LITERATURE SURVEY

In their project titled “Government Tender Allocation Using Blockchain Technology”, Dubey *et al.* developed a website utilizing Java as the frontend and SQL Server as the backend [7]. This platform enabled contractors to apply for government tenders by submitting their required quotations. The bidding process ensued among contractors based on the values of their projects, with the government selecting the contractor team offering the lowest bid. Consequently, the winning bidder proceeded with the project, while others were rejected. However, this system exhibited several disadvantages, including a lack of security, centralized data storage, susceptibility to corruption and bribery, and the absence of involvement from public users to submit their own project proposals to the government and contractors.

In the project “Block Chain based Government Tender Allocation in Cloud” by Fathima and Dhanush, a website was designed to facilitate government tender allocation for contractors, with the government acting as the administrator responsible for releasing tenders and reviewing quotations submitted by contractors [8]. All data were stored in a cloud environment for streamlined processing.

However, this approach had drawbacks such as vulnerability to hacking and unauthorized modifications of data stored in the cloud, reliance on separate sources for admin and contractor access, and a lack of involvement from public users [9].

“A blockchain and edge-computing-based secure framework for government tender allocation” by Hassija *et al.* addressed the challenges inherent in government tender processes, such as eavesdropping on tender values and bribery by corrupt officials [10]. They proposed a secure and transparent framework utilizing edge computing technology. This framework aimed to establish a transparent and secure edge computing infrastructure for government tenders, minimizing the need for extensive human supervision [11]. However, this solution also had its drawbacks, including lower security compared to blockchain networks, higher maintenance costs compared to blockchain networks, and the absence of involvement from public users.

EXISTING SYSTEM

The prevailing system for government tender allocation, excluding the Government e-Marketplace (GeM), encompasses the World Bank's e-Procurement system. This platform serves as a comprehensive solution designed to streamline the procurement processes of government agencies and organizations globally [12]. By facilitating online procurement activities, including tendering, bid evaluation, contract awarding, and supplier management, the system empowers governments to conduct their procurement affairs efficiently. It operates through a centralized platform where government agencies publish tender notices, enabling suppliers to electronically submit bids. Typically, all data are stored in a centralized server, employing consensus and ECDSA algorithm for data integrity and security.

However, this system is not without its shortcomings, including limited competition, risks of delays and cost overruns, vulnerability to eavesdropping and hacking, inadequate transparency and accountability, challenges with recordkeeping and auditability, limited accessibility, and centralized tender evaluation [13].

PROPOSED SYSTEM

Initially, government lenders and contractors engage with the blockchain network to establish a secure edge computing infrastructure. The government lender disseminates tender details to relevant contractors, initiating a double auction process between them and the government lender [14]. Ultimately, the tender is awarded to the contractor offering the lowest bid. The proposed model features a decentralized consortium architecture, combining the security and privacy aspects of a Permissioned Blockchain. Its objective is to efficiently manage government tender processes securely, leveraging the SHA algorithm [15].

Advantages

- *Data Access Control:* Utilizing Ethereum, access to data can be controlled by network nodes based on identity authentication.
- *Decentralization:* Ethereum serves as a decentralized platform, facilitating the creation and operation of smart contracts and decentralized applications (DApps) without the risk of downtime, fraud, control, or interference from third parties.
- *Decentralized Document Storage:* The model supports decentralized document storage, enhancing data security and accessibility.
- *Administrative Functionality:* Administrators can utilize the website for various purposes, adding flexibility and ease of use to the platform.
- *Public Participation:* Public users have the opportunity to contribute by sharing their problems as potential projects for contractors, fostering community engagement and collaboration.

SYSTEM REQUIREMENTS

Hardware Requirements

- Processor: Intel i5
- RAM: 16 GB
- Storage: 500 GB

Software Requirements

- Front End: HTML, CSS, Java Script
- Backend: PHP CodeIgniter, MySQL, workbench 8.0 CE
- OS: Windows 11
- Blockchain: Ethereum platform
- IDE: Visual Studio Code Editor

CONCLUSION

The integration of blockchain technology into the government tender allocation process represents a groundbreaking solution to longstanding issues such as opacity, corruption, and inefficiency. By leveraging blockchain's intrinsic attributes like transparency and decentralization, this innovative approach holds the potential to fundamentally alter how tenders are managed, from announcement to contract awarding. The adoption of blockchain in government tendering not only fosters transparency and trust among stakeholders but also bolsters the process's integrity as a whole. Through its tamper-proof ledger of tender-related activities, blockchain effectively mitigates risks such as fraud and favoritism, ensuring fair and accountable tender allocations.

Moreover, the automation facilitated by smart contracts streamlines the tender allocation process, alleviating administrative burdens, reducing human error, and accelerating decision making. The implementation of blockchain technology in government tender allocation signifies a significant stride towards building public trust, promoting fairness and equity, and optimizing resource allocation. As governments worldwide seek innovative governance solutions, blockchain emerges as a powerful tool for transforming traditional procurement practices into models characterized by transparency, integrity, and efficiency.

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