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Smart Tender System in Python Using Blockchain

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Abstract: ***A new technology that offers efficiency, security, and transparency in the tendering process is the blockchain based e-tendering system. The technique is intended to do away with the conventional paper-based tendering procedure, lessen corruption, and provide all bids an equal chance to win. This system makes use of distributed ledger technology, which guarantees safe, unchangeable, and open transactions. The system enables users to track and confirm the validity of tender documents, bids, and other pertinent data. The blockchain based e-tendering system also provides important advantages like cost savings, greater effectiveness, and shortened time to market. The main advantages and features of the blockchain based e-tendering system are discussed in this paper, along with how it is implemented and the difficulties that must be overcome before it can be successfully used.***

Keywords: Blockchain, E-tendering, Transparency, Security, Efficiency, Distributed ledger technology, Tamperproof, Transparency.

I. INTRODUCTION

Both the public and commercial sectors of the economy depend heavily on the tendering process. The traditional paper-based tendering procedure, however, has been hampered by problems like inefficiency, corruption, and a lack of transparency. By offering a safe, open, and effective mechanism, blockchain technology presents a potential to alter the tendering process. A decentralised platform known as a blockchain based etendering system employs a distributed ledger to securely and openly record transactions. It offers a tamper-proof system for tender documents, bids, and other relevant information, making fraud or corruption almost impossible.

A fair and transparent process is ensured by the system's ability to allow stakeholders to track the entire procurement process, including the submission and evaluation of bids. By Vaishnavi Shantaram Patil Student Department of CSE Sandip University Nashik. Rahul Rustam Khedkar Student Department of CSE Sandip University Nashik. based e-tendering system also promises significant cost savings and greater efficiency. The method also lowers the possibility of mistakes and discrepancies, resulting in a more precise and dependable tendering procedure. This paper intends to examine the main characteristics and advantages of the blockchain based e-tendering system, its implementation, and the issues that must be resolved for it to be used successfully. The blockchain based e-tendering system has the ability to revolutionise the tendering process and enhance procurement practises by offering a safe, open, and effective approach.

II. LITERATURE REVIEW

A. Fair and Transparent Blockchain based Tendering Framework

A Step Towards Open Governance 'Fair and open' can mean several things depending on the circumstance. Where the adage is frequently used, government is where it is more appropriate. Fair and open behaviour on the part of the government means that it acts impartially and that, in response to a citizen's request for information, it provides such information. This does not imply that transparency leads to public confidence in government. The problems with this model are twofold: a) Information is difficult to get and takes a long time to obtain.

Even though it might be possible to audit government activities, reviewing the documents (obtained through the Right to Information Act) still requires time, money, and expertise—things that are difficult for the general public to obtain or invest in. On the other side, there are e-government efforts that make it possible to employ technology in government operations, promoting openness, involvement, and cooperation between the public and the government. Combining open governance and e-government with cutting-edge technology like blockchain has the potential to bring about fairness, transparency, and accountability. Citizens may easily follow the actions of their government while also receiving accountability thanks to an impartial and automatic auditing process that is made possible.

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B. Blockchain As a Service (BaaS) Framework for Government Funded Projects e-Tendering Process Administration and Quality Assurance using Smart Contracts

Government-funded projects must use tendering, which is a cumbersome procedure that encourages corruption due to the lack of transparency. In this paper, a solution employing blockchain as a service is proposed for quick and transparent management of public projects that enables different stakeholders to examine the entire process.The procedure of releasing tenders and choosing the business that offers the lowest price while taking their track record into consideration is a standard part of how government projects operate. This method has numerous faults, including the possibility of bid rigging, demands for bribes from public authorities, the payment of bribes to learn the prices of competing contractors, and threats made against competing contractors. Citizens who use the services do not provide feedback to the system already in place. In order to ensure that bidding is conducted in a genuinely private manner utilising smart contracts, this article offers an architecture built on top of blockchain. This architecture guarantees that the contract is awarded to the deserving contractor. The end users of the infrastructure are frequently ignored, and they must employ numerous strategies and overcome obstacles in order to voice their concerns about the subpar system. This platform guarantees that every contract's data is made public and that citizens can vote on a variety of problems, allowing for monitoring of the government's operations.

C. A Blockchain and Edge Computing-based Secure Framework for Government Tender Allocation

In practically all industries and regions of the world, the usage of blockchain technology has grown quickly.To increase the level of security, privacy, openness, and productivity throughout the government tender process, blockchain technology is a very promising alternative.Blockchain technology can make it possible for all parties interested in a given offer to be a part of the same network and to track the work-flow in detail. Governments in countries including Georgia, the United Kingdom, the United Arab Emirates, Australia, China, Japan, and Russia are moving quickly towards implementing blockchain in their daily operations. The ambitious goal of the Dubai administration is to fully eliminate paper through the broad adoption of blockchain technology. In recent years, governments in some developing nations, like India, have also supported different initiatives and regulations for the adoption of blockchain technology. There have been numerous initiatives to use technology to make government procedures quick and paperless, including online tax filing, online tendering, and online ticketing. Even while the majority of these systems appear to be reliable and well-implemented, they are all built around the concept of a single point of failure: a central server, which is vulnerable to assaults like DOS, Slow-loris, SYN Flooding, and others. Complex bureaucratic procedures in most governments frequently lead to a very inefficient work flow that is rife with corruption, poor management, and human errors. Government tenders are one example of a procedure where malpractices including information leaks, corruption, and bribery are present. Most electronic services and IT infrastructure currently in use have the aforementioned constraints, however new technologies like blockchain have the ability to significantly improve these issues. A permissioned blockchain network can offer the transparency required to efficiently implement national policy for the benefit of the people and establish accountability in the event that the system is abused .Data manipulation is one of the most crucial methods utilised by all adversaries and malevolent groups to affect the public and governmental agencies in the contemporary digital environment. The majority of current systems rely on data, and if the data is inaccurate or poorly correlated, the entire system becomes corrupt. A paradigm shift has occurred when data has shifted from being stored in physical files to being stored digitally.The damage brought on by the loss of digital data, however, would be significantly greater than the damage brought on by the loss of physical files, if the digital data is not protected. Approximately 27 percent more large-scale targeted data breaches occur annually in the U.S. than there were in 2018, according to information from 2019. Data breaches often come from various causes, one of which is digital identity theft. Identity theft is thought to be the root cause of 74% of data breaches worldwide. With over 85% of all digital identities stolen worldwide, the United States surpasses other nations . In addition to data breaches, another problem that is unique to government operations is bribery and needless delays in the procedures. Government employees frequently abuse their administrative authority and demand large bribes to approve contracts.

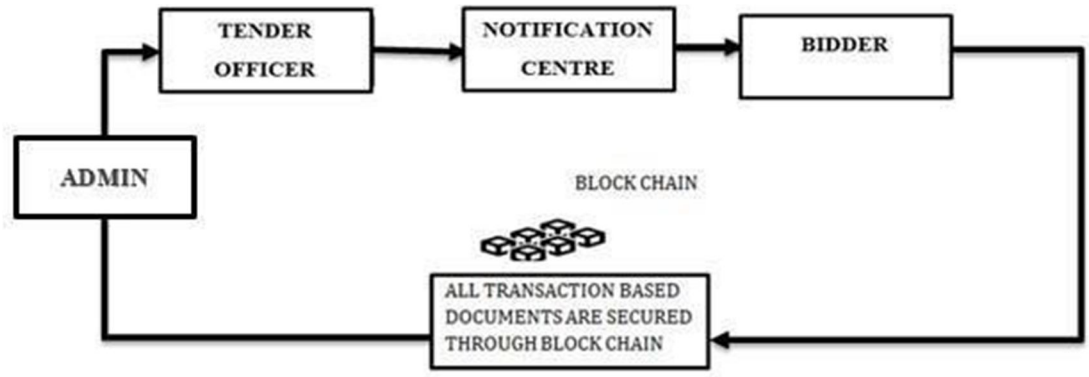
D. A New e-Tendering Model For Fully Automated Tendering Process

Many electronic solutions have been developed and used to digitise the supply chain processes, and as one of the primary processes in the supply chain, it is now highly demanded that the enterprises perform the procurement processes using an e-procurement system. These developments go hand in hand with the revolution in information technology solutions and the widespread replacement of legacy manual procedures with automated and digital workflow procedures. This paper emphasises the significance of utilising the tendering process in an organisation to be totally electronic by adopting the eTendering strategy as part of e-Procurement.

This study suggests a brand-new e-Tendering paradigm that would allow businesses to perform fully automated web-based tendering procedures. The suggested model is a brand-new conceptualization of a fully digital, web-based, and automated tendering solution that addresses every stage of the tendering process and includes all relevant departmental computer system modules and stakeholders. As one of the main challenges in eTendering solutions, which is still lagging behind the digital environment and is being done via paperwork and entered manually in almost all tendering systems that are currently available, it also proposes a new mechanism for bidders' engagement into the e-Tendering system that results in full digital cycle for complete tendering process. The model can be used as a foundation for developing a new framework for the creation of an appropriate e-Tendering system that fully automates the tendering process in any organisation Tendering Management System (TMS). The literature study demonstrates how blockchain based etendering solutions have the potential to increase the transparency, security, and effectiveness of the tendering process. However, the adoption issues that can surface as well as the legal and regulatory environment must be carefully taken into account before the system can be put into place. III. OBJECTIVE A block chain based e-tendering system's goal is to leverage blockchain technology to provide a safe, open, and effective platform for the purchase of goods and services. A few advantages of incorporating blockchain technology into e-tendering systems include: Transparency: Blockchain technology's decentralised structure can guarantee that all parties participating in the tendering process have access to the same information, which lowers the risk of corruption and fraud. Security: Data is protected using cutting-edge encryption methods and blockchain technology, making it nearly difficult to change or manipulate information once it has been recorded. Efficiency: By automating many of the procedures required in the tendering process, smart contracts can cut down on the time and expense involved in procurement. Fairness: The system makes sure that every bidder has an equal opportunity to win the contract and that there is no room for corruption or favouritism. Accountability: By using blockchain technology, all parties participating in the tendering process may be held responsible for their activities, lowering the chance of mistakes or improper behaviour. A blockchain-based e-tendering system's overall goal is to offer a safe, open, and effective platform for procurement that can save businesses time and money while lowering the risk of fraud and corruption.

III. METHODOLOGY

Three entities make up the suggested system:



Bidders, tender officers, and blockchain. Each component of the proposed system is shown in Figure 1 interacting with one another.

1) *Tender Officer:* After registering, the tender officer will enter into the account and update the notification regarding the tender process. They have the opportunity to change or remove the notification component. The officer will now download the tender files that the bidders registered for and decrypt the data in the downloaded files to obtain the bidders' details. A confirmation email was issued to the bidders as acceptance of their tender applications once after receiving their information.
2) *Bidder:* Following registration, bidders can access their accounts to read tender notifications. If the bidder is satisfied with the tender description, he or VI. METHODOLOGY she will give the bidding officer their details in a text file. They can check the tender officer's answer after sending the application.
3) *Blockchain:* By breaking up the data into smaller units, the blockchain is utilised to store encrypted data. Apply the hash code to the chunks here to hide the data after it has been encrypted and stored in a database.

IV. FACILITIES REQUIRED FOR PROPOSED WORK

A secure and transparent platform for conducting tendering procedures is provided by a number of components that are included into the system design of a blockchain-based e- tendering system. Several of the crucial system design elements are listed below:

1) Blockchain network: The system is based on a blockchain network, which offers a decentralised, tamper-proof database for keeping all the data linked to the tendering process.
2) Self-executing contracts known as "smart contracts" are kept on the blockchain network. When specific requirements are satisfied, these contracts—which specify the guidelines for the tendering process— are automatically carried out.
3) The system's user interface enables users to communicate with the blockchain network. This interface may be a web application, a mobile application, or some other user-accessible interface.
4) Identity management: To make sure that only users with permission may access the system, it features an identity management feature. This component secures user identities and blocks unauthorised access using digital signatures and encryption.
5) Bid evaluation and submission: The method enables bidders to electronically submit their offers, and those offers are then stored on the blockchain network. The offers are then automatically reviewed in accordance with the smart contract regulations.

It is important to carefully evaluate the system architecture, data flow, and integration of blockchain technology while designing a blockchain based e-tendering system. A system design for a blockchain-based electronic tendering system is presented in this section.

A. *System Architecture*

The e-tendering system's system architecture is made up of four primary parts:

1) *User Interface:* This part offers a user-interface through which users may communicate with the system, submit bids, retrieve bid papers, and monitor the tendering procedure.
2) *Tendering Engine:* This part controls the tendering procedure, including the assessment of offers and the choice of the successful offer.
3) *Blockchain Network:* This element creates a tamper-proof and transparent system for the tendering process by using a distributed ledger to record all transactions.
4) *Database:* All bid information, tender documents, and other pertinent data are kept in this component.

B. *Data Flow*

The data flow of the e-tendering system is as follows:

1) The system receives and stores tender documents in the database.
2) Through the user interface, bidders make their offers, which are then stored on the blockchain network.
3) The winning bid is chosen after the bids have been evaluated using the predetermined criteria by the tendering engine.
4) The winning offer is saved on the blockchain network, marking the tendering process as complete.

C. *Integration of Blockchain Technology*

To ensure transactions are transparent, secure, and untouchable, the blockchain technology has been implemented into the e-tendering system. The fairness and transparency of the tendering process are ensured by the blockchain network, which maintains a distributed ledger that tracks all transactions, including the submission and evaluation of bids. Additionally, the blockchain network offers an indelible record of every transaction, making fraud and corruption nearly unheard of.

A user interface, a tendering engine, a blockchain network, and a database are all included in the system design of the blockchain based e-tendering system, which guarantees a transparent, secure, and tamper-proof tendering process. Blockchain technology integration offers important advantages like transparency, security, and cost savings, which can enhance procurement procedures.

V. CONCLUSION

To sum up, a blockchain based electronic tendering system is a novel way to carry out tendering procedures. This method makes use of blockchain technology to give stakeholders a safe and open platform to take part in the tendering process. To ensure effectiveness, security, and transparency throughout the bidding process, the system architecture incorporates a number of elements, including a blockchain network, smart contracts, user interface, identity management, bid submission and evaluation, notification and feedback, and audit trail. A blockchain based electronic tendering system offers the advantages of openness, security, efficiency, fairness, and accountability.

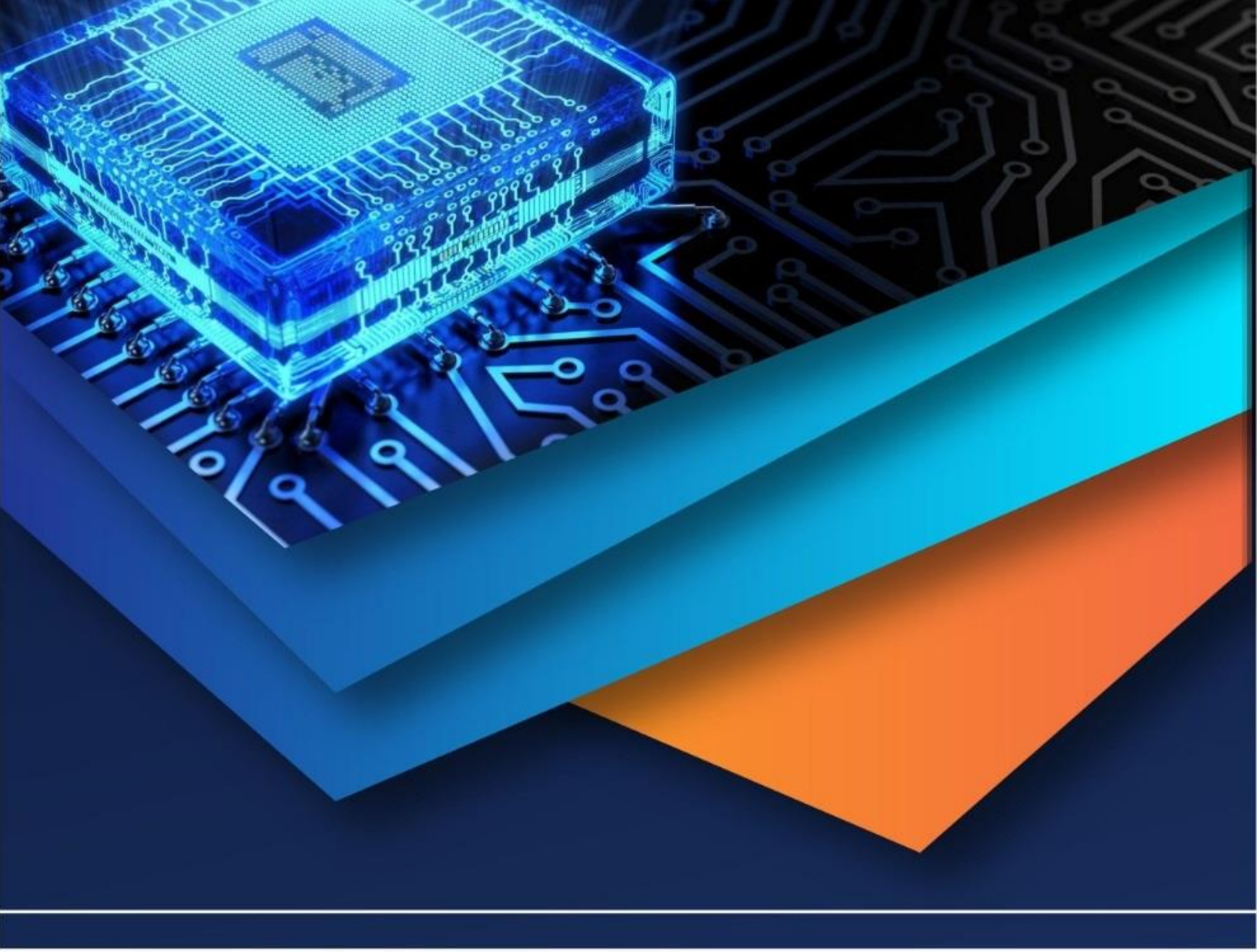
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The e-tendering system will continue to advance and revolutionise the procurement process with the possibility of added features like system integration, AI and ML, mobile access, decentralisation, multilingual support, integration with IoT devices, and use of tokens. The procurement process can be transformed to become more transparent, effective, and safe by using a blockchain based electronic tendering system. A game-changer in the procurement industry, it has the ability to drastically reduce the time, cost, and risk involved with conventional procurement methods.

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