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Intelligent Fish Species Prediction and Blockchain Powered sales Portal

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ABSTRACT

This paper presents a comprehensive web-based platform designed to enhance the efficiency, transparency, and security of the fish trading industry by integrating fish species prediction, auction management, and blockchain technology. The platform enables fish pond owners to predict fish species based on key environmental factors such as pH, temperature, and turbidity, thereby optimizing farm operations and improving yield. It also facilitates a fair and competitive marketplace through an online auction system where owners can create and manage auctions, and buyers can participate in transparent bidding processes. By leveraging blockchain technology, the platform ensures that all bidding details are secure, immutable, and transparent, effectively preventing fraud and fostering trust among users. This innovative solution streamlines the fish trading process, providing a user-friendly interface and robust features that address the critical needs of pond owners, buyers, and administrators, ultimately promoting a more reliable, efficient, and trustworthy fish trading ecosystem.

Keywords: Block Chain, Fish Species, IOT, Security, Auction

I. INTRODUCTION

The global fish industry stands as a vital pillar of food security, economic development, and nutritional well-being, supplying a significant share of the world's protein intake and supporting the livelihoods of millions of people across diverse regions. As the world's population continues to grow and dietary preferences increasingly favor healthier protein sources, the demand for fish and seafood is projected to rise steadily, placing unprecedented pressure on both natural fisheries and aquaculture operations. Aquaculture, the controlled farming of aquatic organisms such as fish, crustaceans, and mollusks, has emerged as the fastest-growing sector in animal food production, now accounting for more than half of all fish consumed globally. This remarkable growth, while essential for meeting global food needs, brings with it complex challenges related to resource management, environmental sustainability, and market efficiency. Fish pond owners and aquaculture managers are tasked with optimizing operations to maximize yield, maintain water quality, and ensure the health of their stocks, all while navigating fluctuating market demands and regulatory requirements. Central to these operational challenges is the critical role of environmental factors—such as water pH, temperature, and turbidity—which directly influence the suitability of a pond for specific fish species and impact overall productivity and

profitability. Traditionally, many pond owners have relied on experience, intuition, or manual observations to select species and manage their ponds, often resulting in suboptimal decisions, increased risk, and reduced yields. The absence of accessible, data-driven tools for species prediction and farm management exacerbates these challenges, particularly for small- and medium-scale producers who may lack technical expertise or resources.

In parallel to these production challenges, the fish trading ecosystem faces persistent issues related to transparency, efficiency, and trust. Auctions are widely employed as a mechanism for connecting fish producers with buyers, providing a platform for competitive pricing and efficient market clearance. However, conventional auction systems—whether conducted in physical marketplaces or through digital platforms—are frequently marred by a lack of transparency, susceptibility to bid manipulation, and disputes over auction outcomes. Manual record-keeping, limited access to real-time information, and the absence of standardized procedures can hinder the efficiency and scalability of these markets, discouraging participation and undermining confidence among stakeholders. Buyers and sellers alike are often confronted with concerns regarding the authenticity of bids, price manipulation, and the security of their transactions, all of which contribute to a pervasive trust deficit in the industry. The digital transformation of trading platforms has introduced new opportunities for efficiency and accessibility, but it has also brought about heightened risks related to data security, privacy, and cyber threats. Ensuring the confidentiality, integrity, and authenticity of sensitive information in digital auctions remains a major concern, particularly as the scale and complexity of transactions increase.

The convergence of modern digital technologies offers a promising avenue to address these multifaceted challenges in fish farming and trading. Predictive analytics, driven by machine learning algorithms and real-time environmental sensing, can empower fish pond owners with actionable insights to optimize species selection, forecast risks, and enhance operational efficiency. By analyzing complex patterns and interactions among variables such as pH, temperature, and turbidity, predictive models can deliver precise recommendations tailored to the unique conditions of each pond, supporting data-driven decision-making and improving yield outcomes. At the same time, blockchain technology has demonstrated transformative potential in securing digital transactions, ensuring transparency, and establishing immutable records. With its decentralized and tamper-proof ledger, blockchain can record every bid and transaction in an auction, making all actions verifiable and accessible to authorized participants. This fosters a higher level of trust and accountability, mitigates the risk of fraud, and streamlines dispute resolution processes. Smart contracts—self-executing agreements coded on the blockchain—can further automate auction rules and settlements, reducing the potential for human error or manipulation and enhancing overall market efficiency.

Despite the promise of these technologies, there remains a significant gap in integrated solutions that holistically address both farm optimization and

secure, transparent trading in the fish industry. Many existing platforms focus exclusively on either production management or digital trading, failing to bridge the critical interface between farm operations and market transactions. Fish pond owners often lack access to predictive tools that are both scientifically robust and user-friendly, while buyers and sellers continue to grapple with opaque and insecure auction processes. The absence of a unified, end-to-end platform limits the potential for efficiency, transparency, and equitable participation in the fish trading ecosystem. Recognizing this gap, this paper introduces the Fish Prediction and Blockchain Enabled Auction Platform—a comprehensive web-based solution designed to connect fish pond owners, buyers, and administrators in a secure, efficient, and user-friendly environment. The platform integrates a machine learning-based species prediction module, enabling pond owners to input real-time environmental data and receive tailored recommendations for optimal fish species selection. This predictive capability not only supports improved yield and resource utilization but also contributes to the sustainability and resilience of aquaculture operations.

In addition to its predictive analytics component, the platform features a robust auction management system, allowing pond owners to create and manage fish auctions, list their products, and interact with potential buyers in a transparent and competitive marketplace. The integration of blockchain technology ensures that all bidding details are securely recorded, immutable, and accessible for verification, effectively preventing fraud and enhancing trust among users. By leveraging smart contracts, the platform automates critical aspects of the auction process, from bid validation to settlement, further streamlining operations and reducing administrative overhead. The user interface is designed to be intuitive and accessible, accommodating the diverse needs and technical backgrounds of pond owners, buyers, and administrators. Through this holistic approach, the platform seeks to empower all stakeholders in the fish trading ecosystem, promoting operational efficiency, market transparency, and equitable access.

The significance of this work extends beyond technical innovation, as it addresses fundamental challenges in food security, economic development, and sustainable resource management. By enabling data-driven decision-making and secure, transparent trading, the Fish Prediction and Blockchain Enabled Auction Platform contributes to the broader goals of sustainable aquaculture, rural development, and global food systems resilience. This paper details the motivation, design, implementation, and evaluation of the proposed platform, highlighting its potential to transform the fish industry and outlining directions for future research and development. Through a comprehensive review of related work, an in-depth discussion of system architecture and integration, and a presentation of experimental results and case studies, the paper demonstrates how the convergence of predictive analytics and blockchain technology can create a more efficient, trustworthy, and sustainable fish trading ecosystem for the benefit of all participants.

II. RELATED WORK

Toward an Intelligent Blockchain IoT-Enabled Fish Supply Chain: A Review and Conceptual Framework, Shereen Ismail, Hassan Reza, Khouloud Salameh, Hossein Kashani Zadeh, Fartash Vasefi,

This paper presents a comprehensive review of current efforts in integrating Blockchain and IoT technologies into the fish supply chain to combat illegal, unreported, and unregulated (IUU) fishing. The authors propose a conceptual framework for an intelligent, decentralized, and traceable fish supply chain system that ensures transparency and authenticity throughout the product lifecycle—from harvesting to consumer delivery. The study emphasizes the importance of machine learning in enhancing fraud detection and freshness assessment, aiming to improve consumer trust and regulatory compliance within the seafood industry.[1]

Toward an Intelligent Blockchain IoT-Enabled Fish Supply Chain, Shereen Ismail

This paper addresses the challenges of illegal, unreported, and unregulated (IUU) activities in traditional fish supply chains and explores how Blockchain and Internet of Things (IoT) technologies can help build secure, transparent, and decentralized traceability systems. It reviews existing research on Blockchain integration in fish supply chains and highlights the advantages of smart systems over traditional models. The authors propose an Intelligent Blockchain IoT-enabled framework designed to track and trace fish products from harvesting to final delivery, ensuring authenticity and quality. Additionally, the paper examines the role of machine learning in assessing fish freshness and detecting fraud, emphasizing its potential to enhance supply chain intelligence and reliability.[2]

Fish Species Prediction and Blockchain Enabled Auction Platform, Prof. Chaitra K G,

This paper presents a web-based application designed to enhance the aquaculture market by integrating fish species prediction and blockchain-powered auction systems. The platform connects pond owners and buyers through a secure, transparent, and data-driven interface. By analyzing environmental parameters like pH, temperature, and turbidity, it predicts suitable fish species using machine learning models, while blockchain ensures the integrity and traceability of auction transactions. The system addresses issues in traditional fish trading—such as fraud, bid manipulation, and lack of transparency—by offering a decentralized, immutable, and user-friendly digital marketplace.[3]

Blockchain-Powered Fish Industry: Trust Perceptions of Final Consumers on Traceable Information Availability, UlpanTokkozhina

This study explores the impact of blockchain-enabled traceability on consumer trust in the fish industry. It examines data from 417 questionnaires completed by fish buyers to determine the relationship between traceable product information and consumer trust. The findings reveal that consumers value traceable products and that the availability of such information fosters trust in the seller. Blockchain technology, with its immutable

and transparent nature, plays a crucial role in ensuring the provenance of fish products, thereby enhancing consumer confidence and potentially driving sales.[4]

Using blockchain and AI technologies for sustainable, biodiverse, and transparent fisheries of the future, Naif Alsharabi,

This research explores the integration of blockchain and AI technologies to create a more sustainable, biodiverse, and transparent future for global fisheries. It addresses critical issues such as overfishing, habitat destruction, and inadequate traceability by leveraging blockchain for secure supply chain tracking and AI for population monitoring and decision-making. The study emphasizes that while early results are promising, further observational studies are essential to confirm the long-term benefits and practical applications of these emerging technologies in fishery management.[5]

IoT-based Smart Monitoring and Management System for Fish Farming, Waddah Abdallah Al-Mutairi.

This research presents the development of an IoT-based real-time monitoring and management system for fish farming, addressing the limitations of traditional manual practices. Each pond functions as a node in a wireless sensor network equipped with microcontrollers, sensors, actuators, and wireless modules. The system uses fuzzy controllers to manage both pond water quality and environmental factors. Practical implementation demonstrated the system's accuracy and efficiency in measuring key variables such as pH, temperature, and dissolved oxygen—ultimately enhancing fish growth, reducing costs, and supporting remote management for better productivity in aquaculture.[6]

Smart tender/contract management system using blockchain, Thilak K, Prof. Priya N,

This paper proposes a blockchain-based smart tender and contract management system aimed at enhancing transparency, security, and efficiency in government and organizational procurement processes. Traditional tender management often suffers from issues such as favoritism, poor record-keeping, lack of transparency, data tampering, and hacking, leading to significant losses and inefficiencies. The authors present a solution using blockchain technology, which leverages encryption and an immutable block-based architecture to secure transaction-related documents, including tender documents, applications, bid proposals, company profiles, historical records, and approval or rejection details By implementing blockchain, the system ensures a transparent, tamper-proof, and decentralized environment for the tendering process, thereby mitigating risks associated with traditional e-tendering systems and enabling all stakeholders to track and verify activities securely.[7]

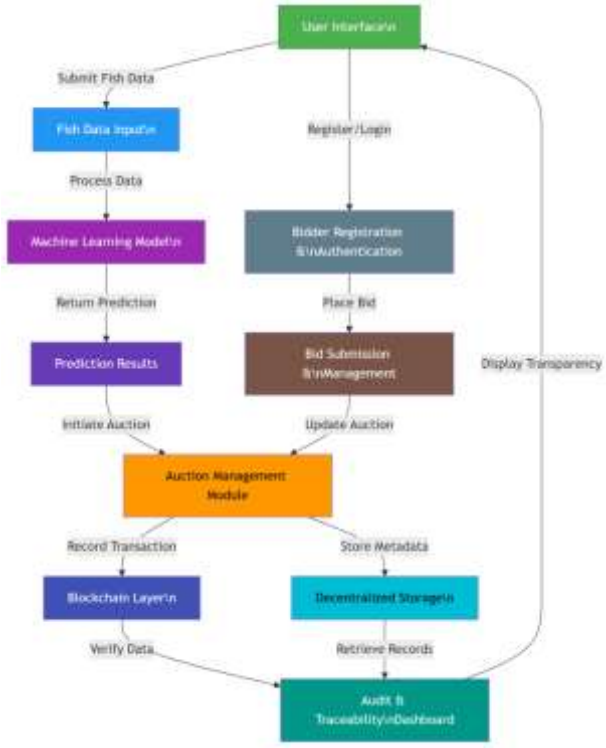
An Intelligent Tender Management System using Block Chain and IPFS, E Sai Tarun Kumar Reddy, Madarapu Sathvik, V. Rajaram, Chilka Prithvi Rao,

This paper presents an intelligent tender management system designed to address the security and transparency challenges commonly faced in traditional e-tendering processes. The authors propose a solution that integrates

blockchain technology with the InterPlanetary File System (IPFS) to ensure secure, tamper-proof, and decentralized management of tender documents and transactions. By leveraging blockchain's decentralized ledger and IPFS's distributed storage, the system protects sensitive information such as tender specifications, bid submissions, business profiles, and performance records from unauthorized access, data manipulation, and hacking. The platform also incorporates AES encryption, OTP authentication via SMTP, and document hashing for enhanced security. Experimental results demonstrate that the proposed system significantly improves transparency, accountability, and security in the tendering process, reducing the risks of favoritism, data loss, and reputational damage associated with traditional tender management systems.[8]

III. METHODOLOGY

The methodology for the Fish Prediction and Blockchain Enabled Auction Platform is structured around three core components: (1) fish species prediction using machine learning, (2) secure auction management, and (3) blockchain integration for transparency and data integrity.



1. Fish Species Prediction Using Machine Learning

To enable accurate and real-time fish species prediction, the platform leverages advanced machine learning algorithms trained on environmental data such as pH, temperature, and turbidity collected from fish ponds. The process begins with data acquisition, where sensors or manual entries provide continuous or periodic measurements of relevant environmental parameters. This dataset is then preprocessed to handle missing values, normalize scales, and encode categorical variables if necessary.

For the prediction model, state-of-the-art machine learning techniques such as Random Forest (RF), Convolutional Neural Networks (CNN), and transfer learning are employed. Random Forest is effective for structured environmental data and has been successfully used for fish classification tasks[1][4]. For image-based or more complex data, CNNs and transfer learning approaches are utilized,

allowing the model to leverage pre-trained layers and adapt to the specific fish species and environmental context of the platform[2][5][8]. The model is trained and validated using a labeled dataset of fish species associated with specific environmental conditions, optimizing for metrics such as accuracy and mean average precision. Once deployed, the model provides real-time predictions to pond owners, supporting data-driven decision-making for species selection and pond management[2][5][8].

2. Auction Management System

The platform incorporates a web-based auction management system that enables fish pond owners to create, manage, and monitor auctions for their fish stock. The auction module supports listing fish lots with predicted species, quantity, quality, and starting bid price. Buyers can browse available auctions, view detailed listings, and place bids in real time. The system enforces auction rules such as bid increments, auction duration, and winner selection through automated logic, ensuring a fair and competitive marketplace.

3.Blockchain Integration for Transparency and Security

To address the challenges of transparency, trust, and fraud prevention in fish trading, the auction system is integrated with blockchain technology. Each auction event and bid submission is recorded as a transaction on a decentralized blockchain ledger. This ensures that all bid details are immutable, time-stamped, and verifiable by all stakeholders, preventing tampering and disputes. Smart contracts are employed to automate critical auction processes, such as validating bids, determining winners, and settling transactions upon auction completion. The blockchain layer provides a transparent audit trail, enhancing trust among pond owners, buyers, and administrators.

4. Platform Architecture and User Interface

The platform is built as a modern web application, providing an intuitive and user-friendly interface for all users. The backend integrates the machine learning prediction engine and blockchain modules, while the frontend allows users to input environmental data, view species predictions, create and participate in auctions, and track auction histories. Role-based access control ensures that pond owners, buyers, and administrators have appropriate permissions and access to relevant features.

5. Evaluation and Deployment

The effectiveness of the machine learning prediction model is evaluated using standard metrics such as accuracy, precision, recall, and F1-score on a held-out test dataset[2][5]. The auction and blockchain modules are tested for performance, security, and usability through simulated trading scenarios and user feedback. The integrated platform is deployed on a secure cloud infrastructure to ensure scalability and reliability.

By combining predictive analytics, secure auction management, and blockchain technology, this methodology delivers a robust solution that enhances operational efficiency, transparency, and trust in the fish trading ecosystem.

IV. TECHNOLOGIES USED

- **Machine Learning and Deep Learning Technologies**

The platform leverages advanced machine learning and deep learning algorithms to enable accurate fish species prediction based on environmental and image data. Convolutional Neural Networks (CNNs) are a core component, as they are highly effective in extracting features from fish images and classifying species with high accuracy. CNNs, especially when combined with transfer learning, can utilize pre-trained models and adapt them to the specific task of fish species identification, significantly improving performance and reducing the need for extensive labeled data. In addition to CNNs, Random Forest (RF) algorithms are used for classification tasks involving structured environmental data such as pH, temperature, and turbidity, providing robust and interpretable results. Data preprocessing and feature extraction are essential steps, involving normalization and transformation of raw sensor or image data to ensure that the models receive high-quality inputs for training and inference. Support Vector Machines (SVMs) and other classic machine learning models may also be employed for final classification or as benchmarking tools, as they have demonstrated effectiveness in various fish species identification studies.

- **Blockchain Technology**

Blockchain technology is integrated into the platform to ensure the security, transparency, and immutability of all auction and bidding transactions. By recording each auction event and bid submission as a transaction on a decentralized ledger, the platform guarantees that all data is tamper-proof and verifiable by all stakeholders. Smart contracts are deployed to automate the enforcement of auction rules, validation of bids, and settlement processes, eliminating the need for manual intervention and reducing the risk of human error or manipulation. The immutable ledger provided by blockchain not only prevents fraud but also fosters trust among pond owners, buyers, and administrators by enabling transparent audit trails for all trading activities. This decentralized approach is particularly valuable in digital marketplaces where trust and data integrity are paramount.

- **Web and Cloud Technologies**

Modern web application frameworks, such as React, Angular, or Vue.js, are used to develop responsive and intuitive user interfaces for pond owners, buyers, and administrators. These frameworks ensure seamless user experiences across devices and facilitate real-time interactions with the platform's backend services. The backend logic, which integrates the machine learning prediction engine and blockchain modules, is typically implemented using robust technologies like Node.js, Python (with Django or Flask), or Java (with Spring Boot). Cloud infrastructure, provided by platforms such as AWS, Azure, or Google Cloud, supports scalable deployment, secure data storage, and computational resources

necessary for training and running machine learning models. This cloud-based approach ensures that the platform can handle large volumes of data and users while maintaining high availability and reliability.

- **Data Collection and IoT**

The platform utilizes environmental sensors and IoT devices to collect real-time data on critical parameters such as water pH, temperature, and turbidity. These sensors provide continuous or periodic measurements, which are essential inputs for the fish species prediction engine. The integration of data collection APIs allows for the seamless transfer of environmental and auction data between the platform's modules, ensuring that all components have access to up-to-date and accurate information. This real-time data acquisition capability enhances the precision of species prediction and supports timely decision-making for pond owners.

- **Security and Monitoring**

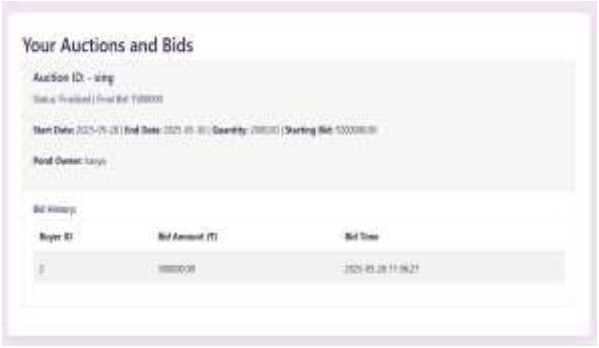
Security is a foundational aspect of the platform, addressed through role-based access control mechanisms that restrict user permissions based on their roles (pond owner, buyer, administrator). This ensures that sensitive operations, such as auction management and bid validation, are only accessible to authorized users. The administrator dashboard provides comprehensive monitoring, auditing, and management tools, enabling platform administrators to oversee all activities, detect anomalies, and ensure compliance with operational and regulatory standards. These security and monitoring features safeguard user data, maintain system integrity, and uphold trust within the fish trading ecosystem.

IV. RESULT

A. Fish Species Prediction

This page is provided to predict fish Species based on the environmental factors.

B. Bid Page



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The model evaluation results show that the Random Forest classifier outperformed both K-Nearest Neighbors (KNN) and XGBoost in predicting fish species based on water parameters such as pH, temperature, and

turbidity. Random Forest achieved the highest accuracy at 80.90%, followed by XGBoost at 79.21%, and KNN at 78.09%. Given its superior performance, Random Forest was selected as the best model and saved along with the scaler and label encoder for future use. This indicates that ensemble-based methods like Random Forest may offer better generalization for this classification task.

V. CONCLUSION

The Fish Prediction and Blockchain Enabled Auction Platform represents a significant step toward addressing the intertwined challenges of production optimization and market transparency in the global fish industry. By combining machine learning–driven predictive analytics with the security and immutability of blockchain technology, the platform empowers pond owners to make data-informed decisions on species selection while simultaneously fostering trust and fairness in fish trading through transparent, tamper-proof auctions. This dual focus not only enhances operational efficiency and profitability for producers but also strengthens confidence among buyers, thereby creating a more equitable and resilient marketplace. Beyond its technical contributions, the platform advances broader objectives of sustainable aquaculture, rural economic growth, and global food security. Through its integrated approach, it demonstrates how digital innovation can transform traditional practices, paving the way for future research, scalability, and widespread adoption in the aquaculture and trading ecosystem.

REFERENCES

[1]. Toward an Intelligent Blockchain IoT-Enabled Fish Supply Chain: A Review and Conceptual Framework, Authors**:** Shereen Ismail, Hassan Reza, Khouloud Salameh, Hossein Kashani Zadeh, Fartash Vasefi, DOI**:**https://doi.org/10.3390/s23115136, ISSN**:** 1424-8220, Publisher**:** MDPI (Sensors Journal)

[2] Toward an Intelligent Blockchain IoT-Enabled Fish Supply Chain: Authors**:** Shereen Ismail, Hassan Reza, Khouloud Salameh, Hossein Kashani Zadeh, Fartash Vasefiresearchgate.net+2nchr.elsevierpure.com+2lifescience.net+2, DOI**:** 10.3390/s23115136, Publisher**:** MDPI, Journal**:** Sensors (Basel, Switzerland)lifescience.net+1wired.com+1, Publication Date**:** May 28, 2023lifescience.net, ISSN**:** 1424-8220

[3]. Fish Species Prediction and Blockchain Enabled Auction Platform, Authors: Prof. Chaitra K G, Anusha G S, Poornima H, Pratiksha G Y, Priyanka K S, DOI: 10.15680/IJIRSET.2025.1405452, e-ISSN: 2319-8753, p-ISSN: 2347-6710, Publisher: International Journal of Innovative Research in, Science, Engineering and Technology (IJIRSET), Volume: 14, Issue 5, May 2025

[4].Blockchain-Powered Fish Industry: Trust Perceptions of Final Consumers on Traceable Information Availability, Authors: UlpanTokkozhina(ISCTE – University Institute of Lisbon)Ana Lucia Martins (ISCTE – University Institute of Lisbon)Joao C. Ferreira(ISCTE – University Institute of Lisbon), DOI: 10.1007/978-

3-031-49379-9_8, Publisher: Springer Nature Switzerland AG, Lecture Notes of the Institute for Computer Sciences, Book: Intelligent Transport Systems, Pages: 151-162, Year: December 2023

[5]. Using blockchain and AI technologies for sustainable, biodiverse, and transparent fisheries of the future, Authors: Naif Alsharabi, Jalel Ktari, Tarek Frikha, Abdulaziz Alayba, Abdullah J. Alzahrani, Amr Jadi, Habib Hamam, DOI: 10.1186/s13677-024-00615-z, ISSN: 2192-113X, Publisher: Springer Nature – Journal of Cloud Computing

[6]. IoT-based Smart Monitoring and Management System for Fish Farming, Authors: Waddah Abdallah Al-Mutairi, Mousa Kasim, Kasim Al-Aubidy, DOI:10.11591/eei.v12i3.3365, ISSN: 2302-9285, Publisher: Institute of Advanced Engineering and Science (IAES) – Bulletin of Electrical Engineering and Informatics.

[7]. SMART TENDER/CONTRACT MANAGEMENT SYSTEM USING BLOCKCHAIN, Thilak K, Prof. Priya N, Publisher: International Research Journal of Modernization in Engineering Technology and Science (IRJMETS) , Volume: 04, Issue: 04, April 2022[1], e-ISSN:2582-5208.

[8]. An Intelligent Tender Management System using Block Chain and IPFS, E Sai Tarun Kumar Reddy, Madarapu Sathvik, V. Rajaram, Chilka Prithvi Rao, Publisher: IEEE, 2023 International Conference on Sustainable Computing and Smart Systems (ICSCSS), DOI:[10.1109/ICSCSS57650.2023.10169649]