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# Development of a Secure E-KYC Verification System Using MERN Stack

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**Abstract -** Digital identity verification is a critical component in modern financial services to prevent fraud and ensure regulatory compliance. This paper presents the development of an electronic Know Your Customer (E-KYC) system built using the MERN (MongoDB, Express.js, React, Node.js) stack. The proposed system allows users to securely upload identification documents and real-time selfies for verification purposes. A dedicated administrative dashboard was implemented to facilitate manual review and approval workflows using Role-Based Access Control (RBAC). Security is maintained through Bcrypt password hashing and JSON Web Tokens (JWT) for session management. The results demonstrate a streamlined, secure, and efficient alternative to traditional paper-based KYC processes.

***Key Words***: E-KYC, MERN Stack, Identity Verification, JWT Authentication, MongoDB.

## 1.INTRODUCTION

The modern financial landscape has undergone a significant transformation due to the rapid integration of digital technologies. This evolution has generated a vital requirement for authentication frameworks that are both secure and operationally efficient. Historically, the Know Your Customer (KYC) protocol was characterized by a heavy reliance on tangible paperwork and human intervention, which frequently led to systemic delays and a higher probability of manual inaccuracies [1]. As global enterprises pivot toward digital-centric operational models, the adoption of Electronic KYC (E-KYC) platforms has emerged as a fundamental necessity to optimize the onboarding of clients without compromising data protection protocols [2].

The present study investigates the creation of a sophisticated E-KYC validation platform utilizing the MERN (MongoDB, Express.js, React, and Node.js) development environment [2]. The central aim of this research is to establish a digital ecosystem where applicants can securely transmit electronic credentials, such as government-issued identification and live photographic verification, for systematic administrative assessment [3]. By implementing a unified web-based framework, the necessity for physical interactions is removed, subsequently accelerating the identity authentication timeline from several business days to just a few minutes.

The design of the suggested system is predicated on three foundational requirements: robust security, system elasticity, and seamless user interaction. Protection of data is ensured through contemporary encryption methodologies, including the implementation of salted password hashing and secure token-led session handling [6]. System elasticity is facilitated by a NoSQL database architecture, which is uniquely suited for managing heterogeneous data sets such as high-resolution imagery and complex user metadata. Furthermore, the interface is

engineered to offer a guided experience for the end-user while providing a high-level monitoring console for administrative oversight.

It is observed that the transition toward these automated verification pipelines facilitates superior organizational throughput and reinforces the reliability of data [7]. By substituting archaic manual documentation with a coherent digital infrastructure, financial entities are better positioned to safeguard confidential records and maintain strict adherence to international regulatory standards.

## 2. LITERATURE SURVEY

In recent years, the transition from physical to digital identity verification has been a major focus in the field of financial technology. Several studies have highlighted that traditional KYC methods are prone to identity theft and documentation forgery[5]. Research into web-based authentication suggests that using a centralized database with encrypted communication channels can mitigate these risks.

Existing systems often utilize a variety of technology stacks; however, many legacy applications suffer from slow processing times due to relational database constraints[4]. Recent literature suggests that NoSQL databases, such as MongoDB, provide the necessary flexibility for storing unstructured data like identity images and metadata. Furthermore, the use of Single Page Application (SPA) frameworks like React has been identified as a superior method for maintaining a seamless user experience during complex data entry tasks. This project builds upon these existing concepts by integrating token-based security to ensure that user data remains confidential throughout the verification lifecycle[9].

## 3. PROPOSED METHODOLOGY

The proposed E-KYC system is designed using a modular architecture based on the MERN technology stack. The methodology focuses on creating a "decoupled" environment where the frontend and backend operate independently but communicate through secure API endpoints.

**I. System Architecture** The architecture consists of four primary layers. The presentation layer is developed using React to provide a dynamic interface for users. The application layer, built with Node.js and Express, handles the routing and business logic. The data layer utilizes MongoDB for persistent storage of user records. Finally, a security layer is implemented using industry-standard protocols to protect against unauthorized access.

**II. Role-Based Access Control (RBAC)** A critical component of the methodology is the implementation of distinct user roles. The system distinguishes between "Applicants," who can register and upload documents, and "Administrators," who possess the authority to verify or reject submissions. It is observed that this separation of duties is essential for maintaining the integrity of the verification process.

**III. Data Security and Validation** To ensure the authenticity of the submitted data, the system implements multi-factor validation. Passwords are encrypted using the Bcrypt hashing algorithm before being stored. Furthermore, session management is handled via JSON Web Tokens (JWT), which are issued upon successful login and validated for every subsequent administrative request.

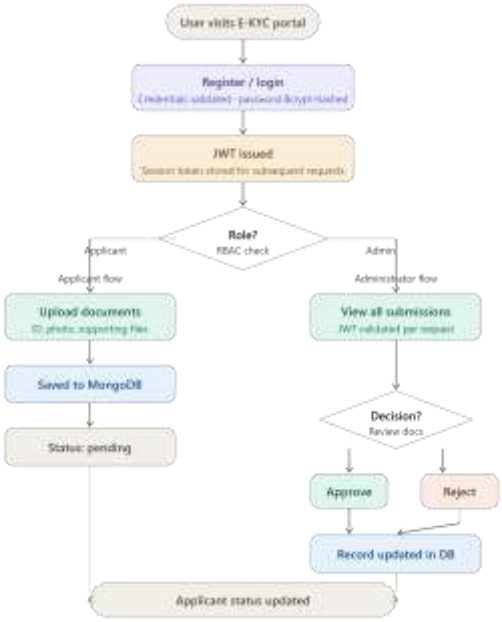



**Fig -1:** E-KYC Process Flowchart

## 4. IMPLEMENTATION

The development of the Electronic Know Your Customer (E-KYC) system involves a layered implementation approach. The frontend is constructed using React.js to create a responsive User Interface (UI). This interface communicates with a backend server developed using Node.js and the Express.js framework through various Application Programming Interface (API) endpoints.

**I. Database Configuration** A NoSQL database, MongoDB, is utilized to maintain data persistence. Unlike traditional relational databases, MongoDB allows for the storage of flexible user profiles and metadata associated with identity documents. For this implementation, a local instance of the database is configured to ensure that all sensitive verification data remains within a controlled environment during the testing phase.

**II. Security and Middleware** Security is a primary focus of the implementation layer. The system utilizes the Bcrypt library to perform password hashing, ensuring that user credentials are not stored in plain text. Furthermore, JSON Web Tokens (JWT) are implemented to manage authenticated sessions. To handle the uploading of physical documents and photographs, the Multer middleware is integrated into the backend logic to process multipart/form-data efficiently.

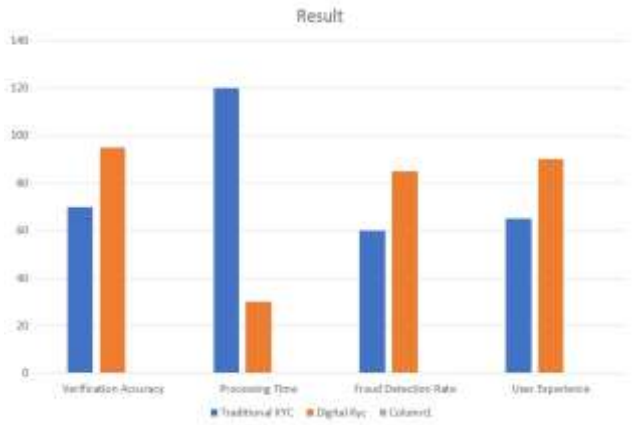
## 5. RESULT AND DISCUSSION

With this paper we aimed and accomplished a solution that reduces the aggregated cost of the process of KYC in an ecosystem by means of Blockchain. We solved the first part of the problem by avoiding redundancy of tasks needed to be performed by the customer in case of multiple 5 6 financial institutions. Moreover, we suggested following the verification process for one customer only once and maintaining it centrally. This not only helps the customer's in making their experience less cumbersome but also drastically reduces the cost of KYC process undertaken by the financial institutions in hiring third parties to carry out background checks, etc for their customers. Hence, the ultimate efficiency gain of our proposed solution was the dual benefit of reduced cost for the institutions and better experience for the customers.

| Entity | Value |
|---|---|
| Language | Node.js, Express.js |
| IDE | VS Code |
| Frontend | HTML,CSS ,JAVASCRIPT, REACT JS |
| Algorithm Implemented | Bcrypt |
| Database | MongoDB |

**Table -1**: Coding Details

Charts




## 6. LIMITATIONS

While the developed E-KYC system offers significant improvements over manual processes, certain limitations are observed during the testing phase. The system currently requires a stable internet connection for both applicants and administrators to interact with the MERN (MongoDB, Express.js, React, and Node.js) architecture.

Furthermore, the accuracy of the verification process is dependent on the quality of the images uploaded by the user; low-resolution photographs or poor lighting conditions may hinder the manual review process. It is also noted that the current implementation lacks an automated feature to detect forged or digitally altered documents without human intervention.

## 7. CONCLUSION AND FUTURE WORK

The development of the Secure E-KYC Verification System successfully demonstrates the capability of modern full-stack web technologies in streamlining identity management. It is concluded that the integration of Node.js for backend processing and React for a dynamic user interface significantly reduces the operational bottlenecks associated with traditional paper-based methods. The implementation of Role-Based Access Control (RBAC) and JSON Web Tokens (JWT) ensures that sensitive user data remains protected and accessible only to authorized administrative personnel.

In the future, the system can be enhanced by integrating Optical Character Recognition (OCR) to automatically extract text from identification cards, thereby reducing manual data entry errors. Additionally, Artificial Intelligence (AI) algorithms can be implemented for automated face matching between the live selfie and the document photo. The inclusion of liveness detection could further strengthen the security layer by preventing spoofing attacks using static images.

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