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Blockchain-Based Digital Cheque Clearance and Verification System

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Abstract
This research work possesses detailed functioning of cheque truncations. Cheque is a financial document issued by an individual bank to its customers for the purpose of a transaction from one person to another as well as self-transaction. This is also known as CTS (Cheque truncation system). The proposed system is based on blockchain where all banks are starting to adapt its contents for various purposes on day-to-day usage for its customers. This proposed cheque-clearing system includes more secure as well as sophisticated facilities in it. The cheques do deposit physically but can get cleared and verified digitally. Our proposed system is highly scalable because it's used algorithms and techniques. On average, cheques get approximately a day or 3 to get clear, to evaluate this time consumption it is a fast and secure solution on to this problem which is time-saving. This research work focuses on the detailed functioning of cheque truncation and the adoption of blockchain technology in the Indian banking system for cheque clearing and various other applications. Cheque truncation is the process of eliminating physical movement of cheques in the clearing process. Traditionally, the physical cheques are exchanged between banks, leading to delays and security risks. With the introduction of the Cheque Truncation System (CTS), cheques are processed digitally, reducing the clearing time and enhancing efficiency. The proposed cheque-clearing system leverages blockchain technology, specifically the SHA-256 algorithm, to provide a more secure and sophisticated solution. SHA-256 is a cryptographic hashing algorithm that generates a unique hash value for each transaction or data element. It ensures the integrity and immutability of the data stored on the blockchain. The adoption of blockchain in cheque clearing brings several benefits to the Indian banking system. Firstly, it enables faster and more efficient clearing of cheques. Instead of the traditional T+1 clearing time, where T is the day of submission, the blockchain-based system significantly reduces the clearing time, potentially processing transactions within minutes. Moreover, the blockchain-based cheque clearing system offers enhanced security. The use of SHA-256 algorithm ensures that the transaction data is tamper-proof and cannot be altered once recorded on the blockchain. This protects against fraudulent activities and enhances trust among stakeholders. Beyond cheque clearing, blockchain technology has various other applications in the Indian banking system. It can be utilized for secure and transparent record-keeping of customer transactions, simplifying Know Your Customer (KYC) processes, streamlining international remittances,

enabling smart contract-based agreements, and improving the overall efficiency and transparency of banking operations. The scalability of the proposed system is a significant advantage. Blockchain technology is designed to handle a high volume of transactions and can be scaled horizontally by adding more nodes to the network. This ensures that the system can accommodate the increasing number of cheques and transactions efficiently. By leveraging blockchain technology, the proposed system offers a fast, secure, and scalable solution to the existing challenges in cheque clearing. It enables digital verification and clearance of cheques, reduces the clearing time significantly, enhances security, and opens up opportunities for broader adoption of blockchain in the Indian banking sector.

1. Introduction

1.1 About Blockchain:

Blockchain is ab distributed ledger of all sorts of transactions across peer-to-peer networks all over the globe. This technology is used to confirm transactions without involving an external authority. All involved participants can verify their details on their own.

In an era dominated by centralized intermediaries (authorities such as banks in our case), the original blockchain emerges as a groundbreaking open-source technology, revolutionizing the way we perceive currency transfers. Offering a compelling solution to the traditional system, this decentralized marvel empowers individuals by eliminating the need for intermediaries in crypto-currency transactions. The nature of blockchain is immutable(unchangeable) and transparent which is an additional leverage for its users thus, this is going to be a new era of financial independence and security dawns upon us.

1.2 About Cheque:

Cheques play the most vital role in a significant segment of payment mode in India. Despite the rise of various digital payment methods cheques are still utilized due to their familiarity and established infrastructure in India. That's why most of the businesses, organizations all across the world not only India chose this as a transaction medium.

The crucial role in cheque transactions is of the RBI (Reserve Bank of India) in clearance. In the mid-1980s, they introduce Magnetic Ink Character Recognition (MICR) technology to streamline the process. The MICR technology used in banking industry for processing and clearing cheques. It contains unique set of characters using a special magnetic ink at the bottom if cheques. These characters are machine-readable, which contains important information like bank code, branch code, and account number etc.

The present MICR system requires cheques to be physically moved from place to place and it involved various processes at various stages which takes more time to clear and deposit the amount from one account to other account. The cheque truncation [CTS] is process where physical cheques are replaced by digital images and their responsible data within it. This digital transformation saves time and costs, improves efficiency but not the risk of fraud. That's why we have used the SHA-256 (Secure Hash Algorithm-256) as well as the OCR (Optical Character Recognition) using blockchain technology BCT, which ensures the security and immutability of data002E

2. Proposed System

Our innovative proposed system introduced a streamlined cheque-clearing process by combining blockchain technology, SHA-256 encryption, and OCR. Cheques are digitized using OCR, ensuring accurate data extraction, while SHA-256 encryption generates unique and secure hashes to protect the probity of cheque information. This solution aims to create a secure, efficient, and transparent cheque-clearing process aligned with modern baking needs so that users can get a more enhanced experience with new technology. With the proposed system, cheque clearance time is significantly reduced. Instead of relying upon physical transportation and manual processing the digitized cheques are securely and swiftly transmitted across the blockchain network.

2.1 SHA-256:

SHA-256 (Secure Hash Algorithm 256-bit) is a cryptographic hash function that plays a vital role in ensuring the security and integrity of data. Now lets us see the elements included in SHA-256,

Hash function: A hash function is a mathematical function that takes an input (data) and produces a fixed-size string of characters, known as a hash value or hash code. It is designed to quickly compute the hash value and ensure that even a small change in the input data will result in a different hash value.

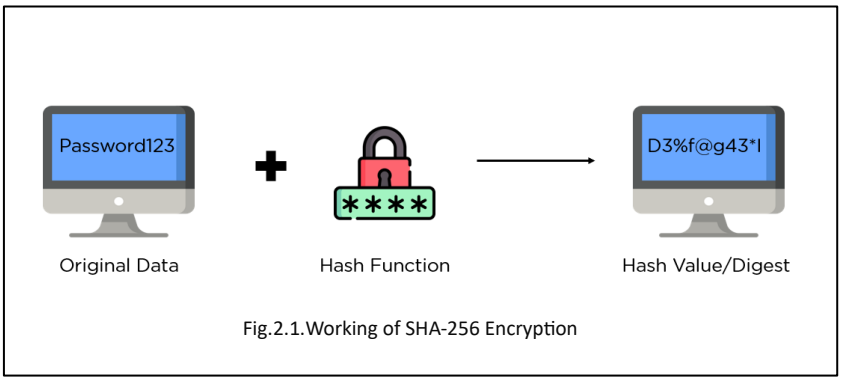


Fig.2.1.Working of SHA-256 Encryption

SHA-256 is one specific type of hash function, belonging to the SHA-2 family. It operates in 256-bit blocks of data and generates the cryptic code value (hash value). SHA-256 works including the following concepts;

1. Padding: The input data is divided into fixed-size blocks. If needed, the last block is padded to meet the required length.
2. Message Schedule: Each block is further divided into smaller pieces called 32-bit words, creating a message schedule.
3. Initial Hash Values: SHA-256 has predefined initial hash values, known as the hash state. These values are combined with the message schedule.
4. Compression Function: using logical operations and mathematical functions to transform the data and update the hash state.
5. Final Hash Value: After processing all blocks, the resulting hash state is combined to create the final hash value. This value represents the unique fingerprint of the input data.

2.2 OCR:

We've used the Tesseract OCR which is an open-source Optical Character Recognition engine developed by Google. It's widely used for extracting text from images or scanned documents. Tesseract is known for its accuracy and versatility, supporting over 100+ languages.

Image processing is also done under the Tesseract OCR, it includes image preprocessing techniques to enhance the OCR results which also incorporates image binarization, noise reduction, skewing, and to detect text accuracy. Character recognition also comes under Tesseract OCR, it employs pattern recognition algorithm and machine learning techniques which we need in recognizing the characters on cheques.

2.3 Blockchain Technology (BCT):

Blockchain technology has gained significant attention in the financial services industry due to its transformative potential. It is not just a buzzword; it is reshaping the way businesses operate and interact. By leveraging the power of distributed ledgers, blockchain technology provides a secure and transparent platform for conducting financial transactions.

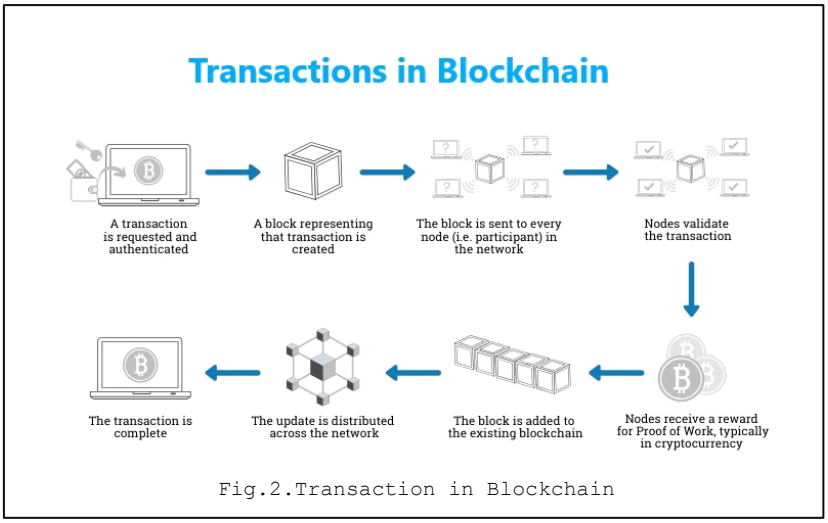


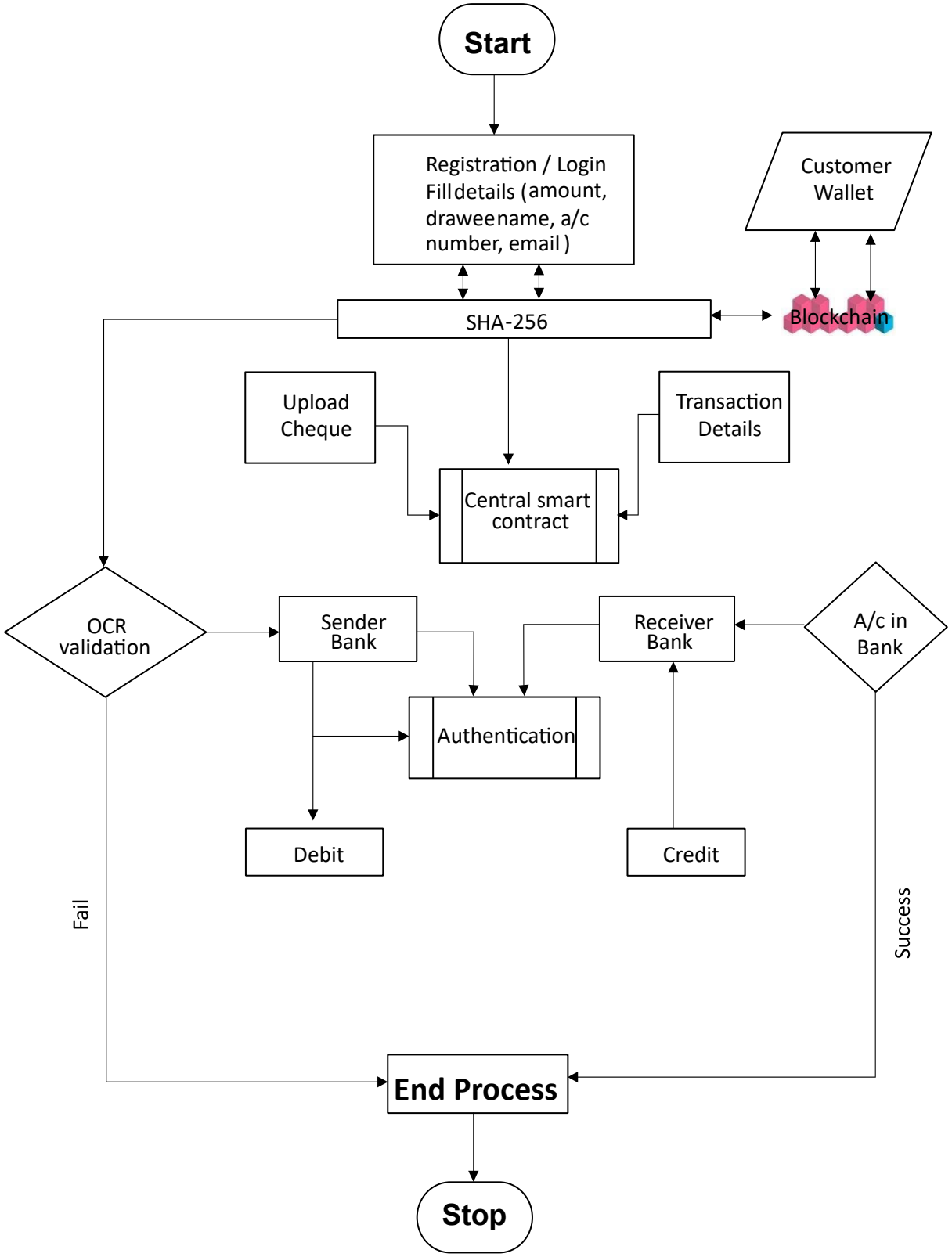
Fig.2.Transaction in Blockchain

In our proposed system, we harness the capabilities of blockchain to create a more efficient and reliable system for payments, digital banking, and cheque-clearing system. By utilizing blockchain's decentralized infrastructure, we eliminate the need for intermediaries, reducing costs and enhancing speed. This technology ensures the immutability and integrity of transaction data through cryptographic techniques like SHA-256, safeguarding against fraud and tampering.

With our solution, businesses can seamlessly connect with new payment ecosystems and expand their reach. The decentralized nature of blockchain fosters trust among participants, enabling seamless peer-to-peer transactions and reducing reliance on traditional financial institutions.

Furthermore, our technology incorporates advanced OCR (Optical Character Recognition) algorithms, such as Tesseract OCR, to extract relevant information from cheques and automate the clearing process. This integration streamlines operations, reduces manual errors, and enhances efficiency.

By combining the strengths of blockchain, SHA-256, and OCR, our proposed system for cheque clearing, provides a secure, transparent, and automated solution. It empowers businesses to embrace digital transformation, enhance customer experiences, and drive innovation in the financial landscape.



3. Architecture

1. Registration/Login:

- Users will go through a registration process to create an account in the cheque-clearing system.
- During registration, users will provide their details such as their full name, address, contact information, and bank account details.

- They will set up login credentials (username and password) to securely access the system.
- The registration process may also include additional security measures like email verification or two-factor authentication.

2. Fill Details (Amount, Drawer Name, A/C Number, Email):
- Users will enter the cheque details required for processing and validation.
- The amount field will capture the monetary value mentioned on the cheque.
- The drawer's name refers to the person or entity who issued the cheque.
- The A/C number field will store the account number associated with the cheque.
- The email field will capture the user's email address for communication and notification purposes.

3. Upload Cheque:
- Users will upload a scanned image or a digital representation of the cheque through the system interface.
- The uploaded cheque image should be clear and legible to facilitate accurate processing.
- The system will validate the format and quality of the uploaded cheque image to ensure it meets the required standards.

4. Central Smart Contract:
- The system will utilize a central smart contract deployed on the blockchain network.
- This smart contract will serve as a decentralized ledger, recording and managing cheque transactions.
- It will contain predefined rules and logic for processing and verifying cheque transactions.
- The smart contract will automatically execute the necessary actions based on the transaction details and predefined business rules.

5. Transaction Details:
- It includes the cheque details, including the amount, drawer's name, and account number, which will be associated with a specific transaction.
- Each transaction will be uniquely identified and recorded in the blockchain network.
- The transaction details will include relevant information such as the timestamp, transaction ID, and parties involved, amount transferred.

6. Blockchain Wallet:
- Each user will have a blockchain wallet associated with their account.
- The wallet will store its digital assets, including any tokens or funds related to cheque transactions.
- It will provide a secure and tamper-proof environment for managing and transferring digital assets within the blockchain network.
- The wallet will also facilitate the signing of transactions using the user's private key to ensure authenticity and integrity.

7. SHA-256:
- The SHA-256 algorithm will be used for the cryptographic hashing of important data within the system.
- It will generate a unique hash value for each transaction or data element, making it highly secure and tamper-resistant.
- SHA-256 hashing will be applied to critical data such as transaction details, cheque information, and user credentials.
- The generated hash values will be stored in the blockchain network to ensure data integrity and immutability.

8. OCR Validation:
- Optical Character Recognition (OCR) technology will be employed to extract relevant data from the cheque image.
- OCR algorithms will analyze the image and identify key information such as the payee's name and account number.
- The extracted data will undergo validation to ensure its accuracy and consistency with the user-provided details.
- OCR validation will involve cross-checking the extracted data against the user's account information and previously recorded cheque data.

9. Authentication Start:
- The system will implement authentication mechanisms at the beginning of the process to verify the identity and authorization of the users and parties involved.
- Users will be required to provide valid login credentials, such as a username and password, to access the system.
- Additionally, cryptographic signatures or other authentication methods may be employed to ensure the integrity and authenticity of transactions.

10. A/C in Bank (Sender Bank, Receiver Bank):
- The sender and receiver banks involved in the cheque-clearing process will have their respective accounts within the system.
- Each bank account will be linked to the user's account and associated with their transactions.
- The sender's bank account will be debited with the cheque amount during the clearing process, while the receiver bank account will be credited.

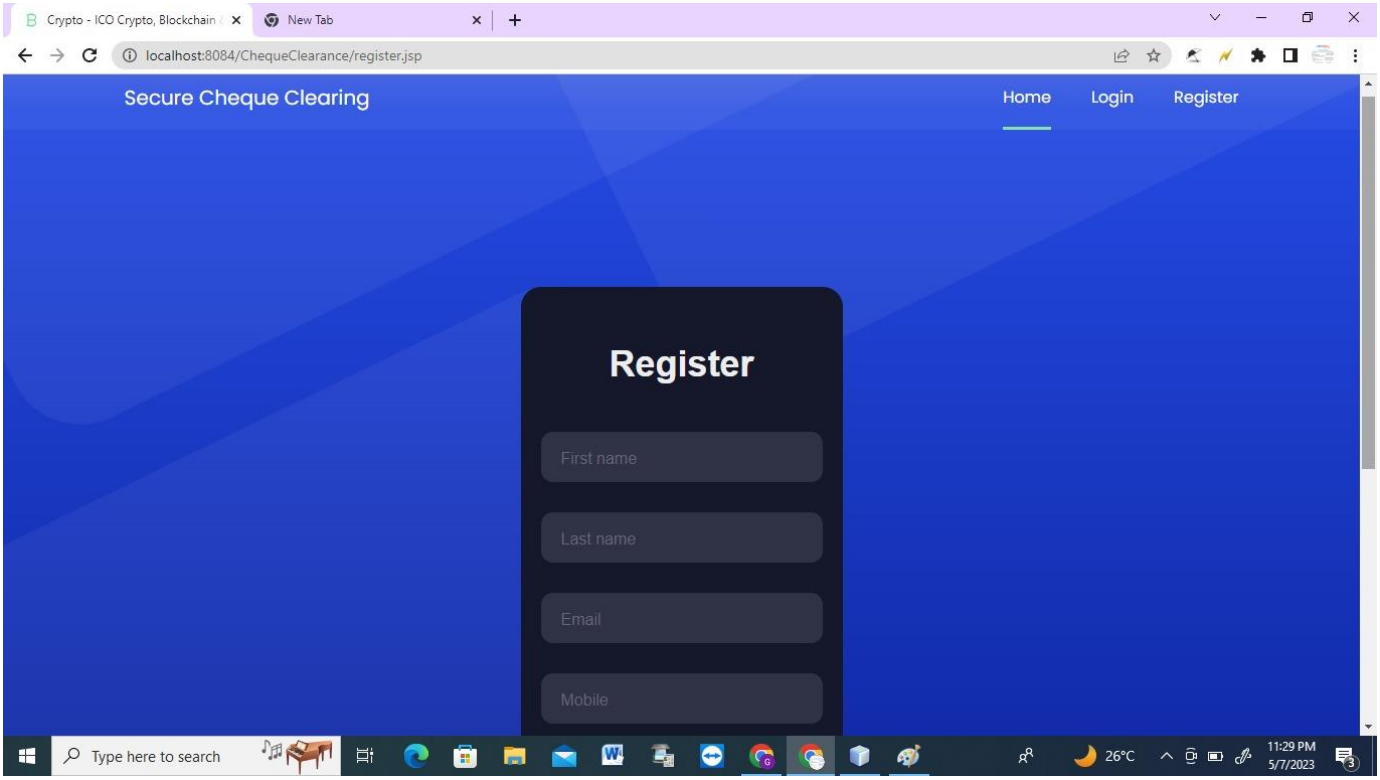
11. Fail, Success:
- The outcome of the clearing process will be determined as either a failure or a success.
- If any errors, discrepancies, or violations are identified during the processing, the transaction will be marked as a failure.
- A successful outcome indicates that the cheque clearing process has been completed without any issues or violations.

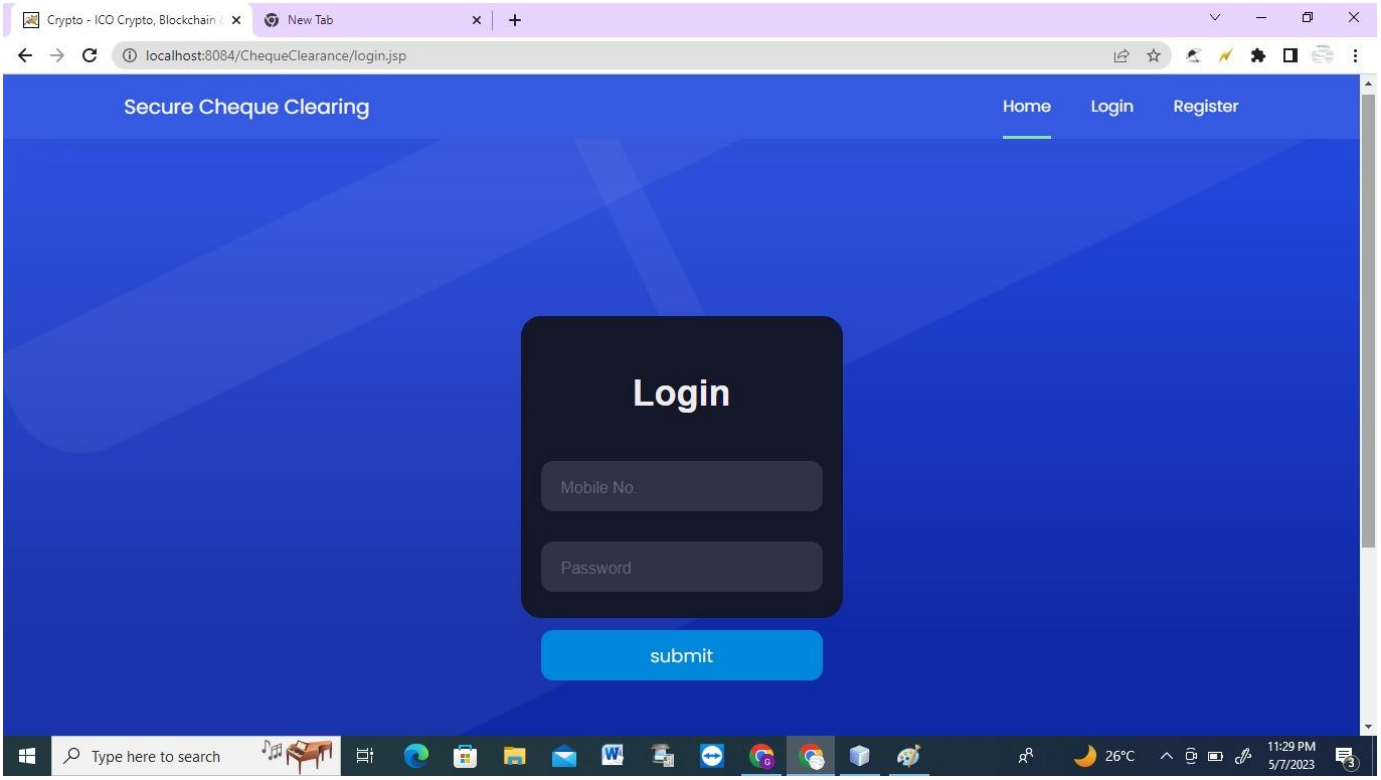
12. Stop, Debit, Credit:
- During the clearing process, the system may encounter scenarios where the cheque needs to be stopped or further actions need to be taken.
- If the cheque is found to be invalid, fraudulent, or flagged for any reason, the system will stop the transaction and notify the concerned parties.
- In case of a valid cheque, the sender's account will be debited with the cheque amount, and the receiver's account will be credited accordingly.

13. End Process:
- Once all the necessary validations and verifications are complete, the system will proceed to the end process.
- This stage involves finalizing the cheque clearing transaction and updating the account balances accordingly.
- The system will perform the necessary debit and credit operations to transfer funds from the sender's account to the receiver's account.
- The end process also includes generating transaction receipts and updating transaction status.

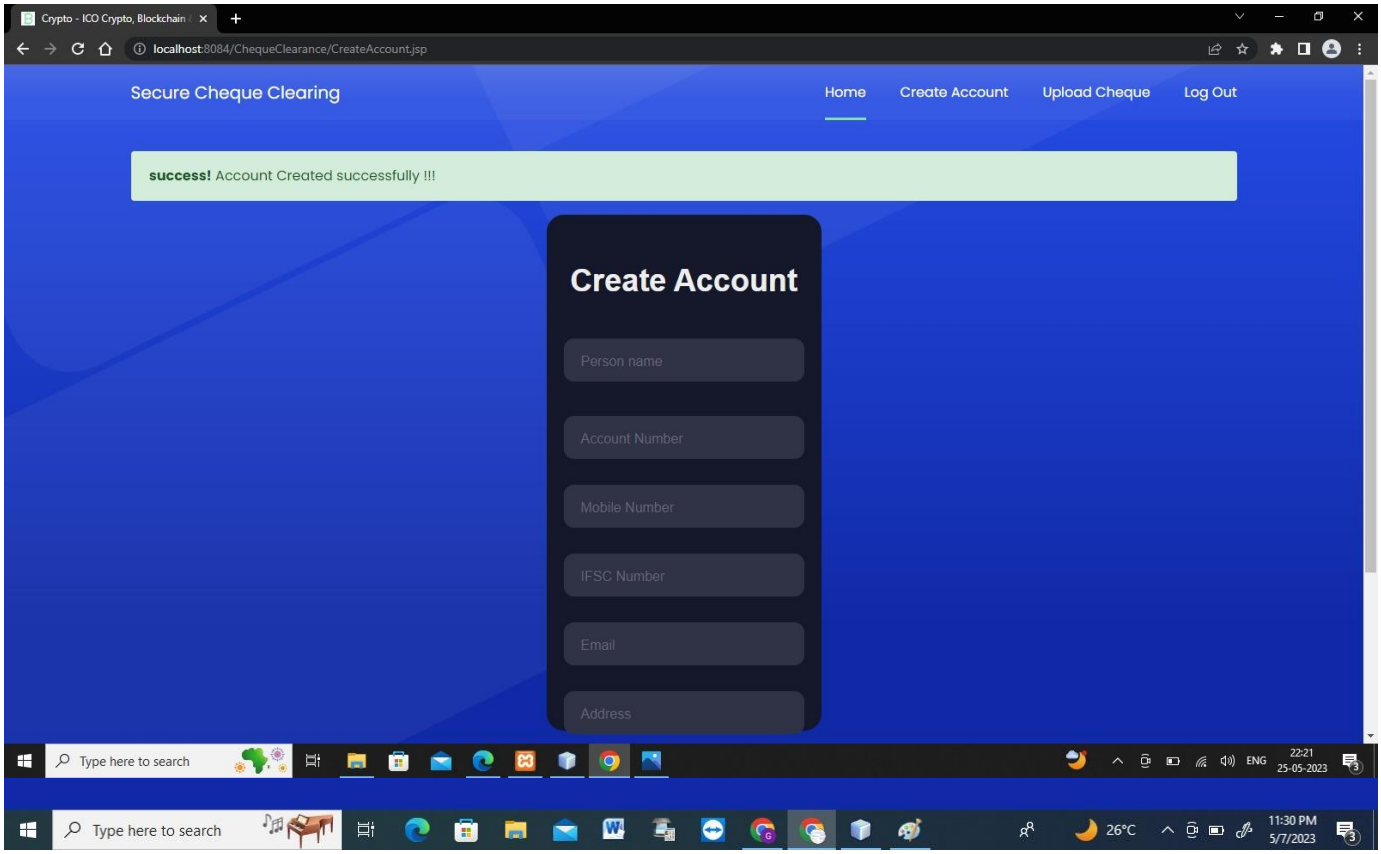
4. Output Details

4.1 Registration / Login page: -



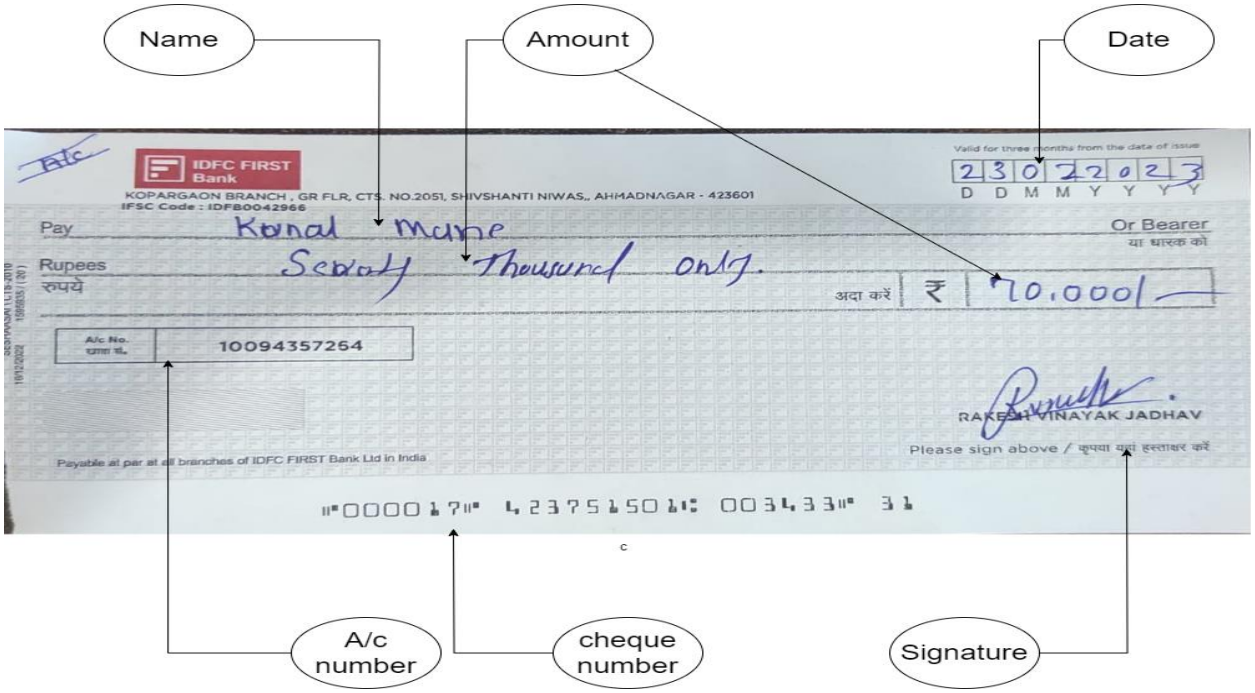


4.2 Create account: -

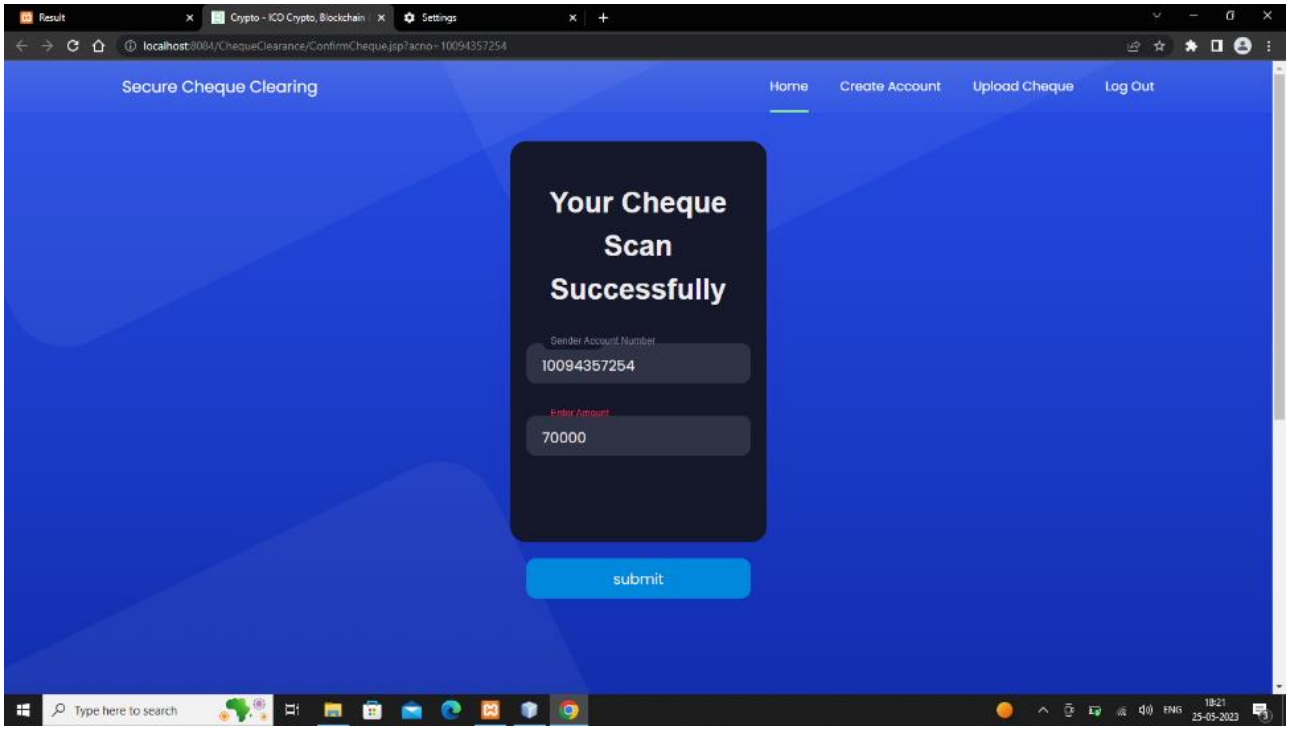


4.3 Upload Cheque: -

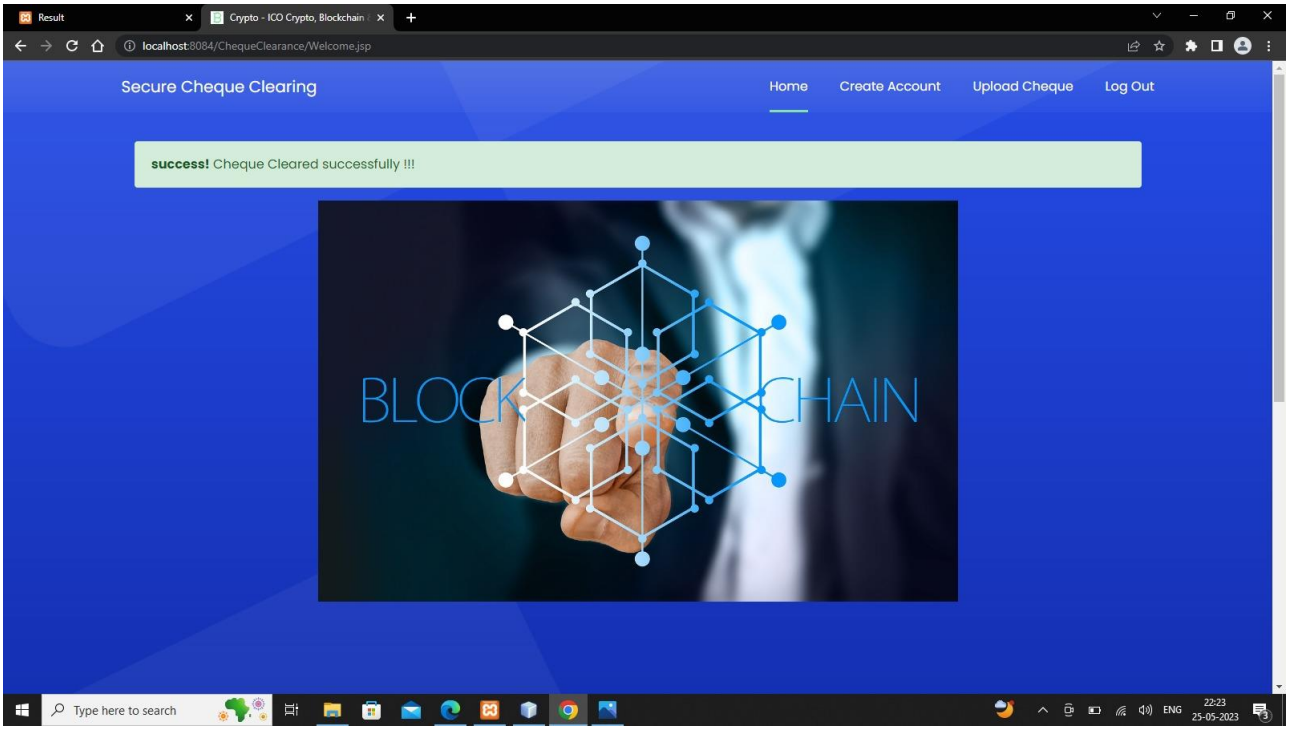
4.4 Cheque details fetching using Tesseract OCR: -



4.5 Scanning and extracting done successfully: -



4.6 Transaction Successful: -



5. Privacy

The traditional banking model in India has traditionally emphasized the importance of privacy measures to ensure that sensitive information is accessible only to the parties involved and the trusted financial institutions. However, with the rise of digital transactions and the increased need for transparency, maintaining the same level of privacy has become more complex. As a result, alternative methods have been developed to safeguard privacy effectively while still adhering to the requirement of public transaction announcements. Nevertheless, despite the public nature of blockchain transactions, privacy can still be preserved through innovative techniques. One such method is the utilization of cryptographic protocols like zero-knowledge proofs. Zero-knowledge proofs enable parties to prove the validity of a statement without revealing any additional information. In the context of transactions, zero-knowledge proofs can be employed to demonstrate the ownership of sufficient funds for a transaction without exposing the actual transaction amounts or the wallet balances. It's important to note that while privacy measures are crucial for protecting sensitive financial information, regulatory compliance and anti-money laundering initiatives are equally important considerations. Striking the right balance between privacy and regulatory requirements is a continuous effort that involves collaboration between banking institutions, regulators, and technology providers. As the Indian banking model continues to evolve, embracing innovative technologies like SHA-256 encryption, Tesseract OCR, and blockchain-based cheque clearing processes can effectively address privacy concerns while promoting efficiency, security, and transparency in financial transactions.

By understanding this we can contemplate that the traditional system has many loop holes and some areas which are hidden to its user, to clearly understand this we can refer the below figure. So, to tackle this our proposed concept will work just fine by adding more transparency and security using SHA-256 and blockchain with addition of email authentication to its user.

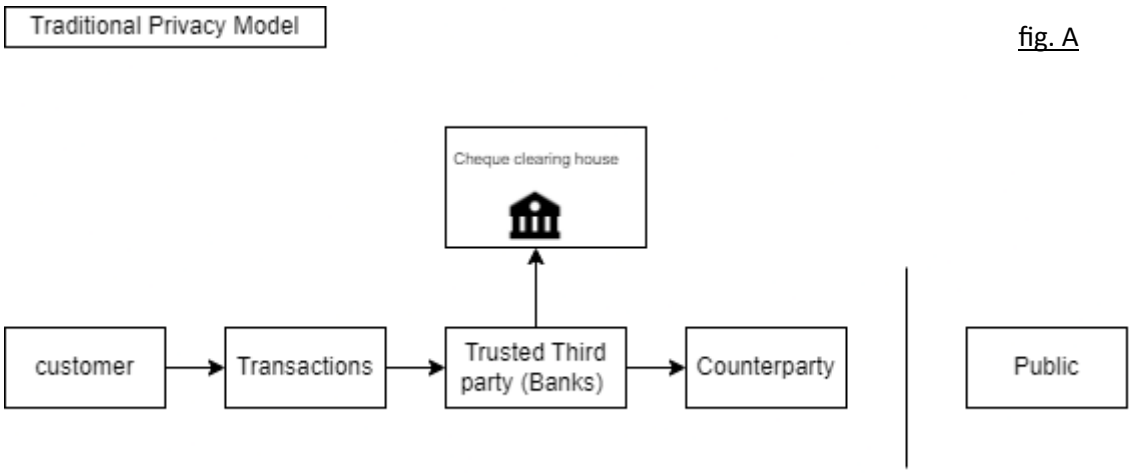


fig. A

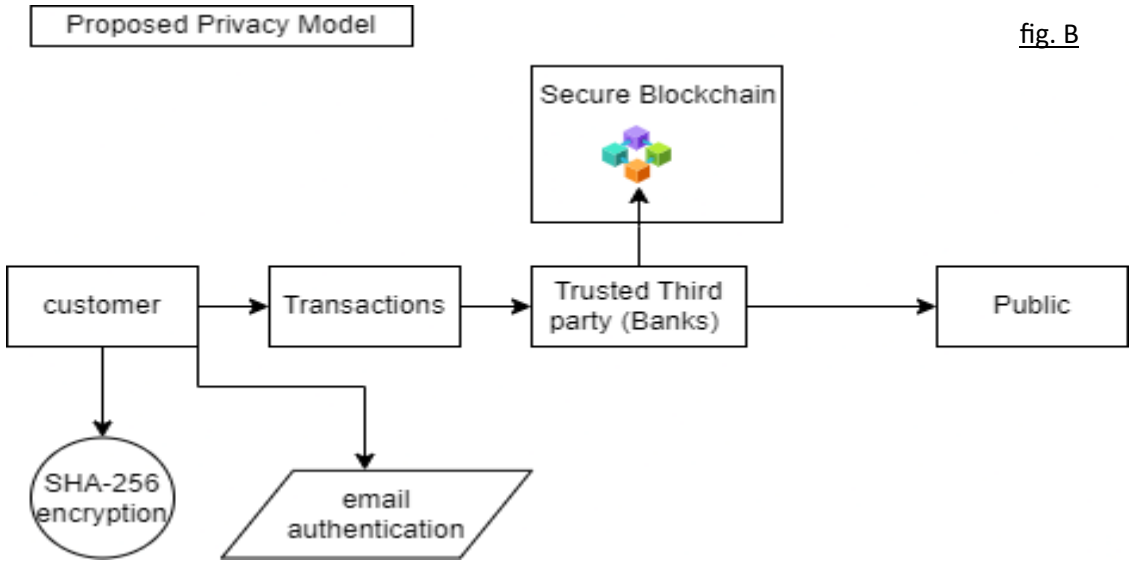


fig. B

5. Future Scope

The future of our blockchain based digital cheque clearing technology in the Indian banking sector holds immense potential. We anticipate widespread adoption as financial institutions recognize the efficiency, transparency, and security benefits it offers. Our solution seamlessly integrates with existing banking systems, facilitating a smooth transition without disruption. This integration will foster interconnected ecosystems, where different banks and financial platforms collaborate to create a more efficient and connected financial landscape. Smart contract integration will automate cheque clearing processes, streamlining operations and improving efficiency. Additionally, the incorporation of advanced security measures, such as SHA-256 encryption, ensures the integrity and confidentiality of transaction data. Compliance with regulatory requirements, including KYC and AML protocols, is a priority to maintain a secure and trustworthy ecosystem. Furthermore, the integration of OCR technology, such as Tesseract OCR, enables automated extraction of cheque information, reducing manual errors and enhancing operational efficiency. As our technology gains traction, we envision expanding its implementation across the Indian banking sector, facilitating secure and efficient cheque clearing processes nationwide. This comprehensive approach will revolutionize cheque clearing, enhance customer experiences, and drive innovation in the Indian banking industry.

5. CONCLUSION

In conclusion, the integration of blockchain technology into cheque-clearing processes has the potential to revolutionize the Indian banking sector. The adoption of our blockchain-enabled solution offers numerous benefits, including increased efficiency, transparency, and security. By leveraging the power of distributed ledgers, smart contracts, and advanced OCR technology, financial institutions can streamline cheque-clearing operations and reduce manual errors. The use of blockchain ensures that the transaction data is tamper-proof and provides an immutable record of all cheque transactions. This not only enhances trust among stakeholders but also enables auditors and regulators to have real-time access to transactional data, facilitating regulatory compliance. Our blockchain-based solution also opens up opportunities for collaboration and interoperability among different banks and platforms. It allows for seamless and secure transfer of funds between different banking institutions, eliminating the need for intermediaries and reducing transaction costs. This interconnected financial ecosystem promotes a more

efficient and integrated banking experience for customers. Looking ahead, there are several future advancements and expansions for our technology. We plan to enhance the security features of the system by exploring advanced cryptographic techniques and implementing multi-factor authentication mechanisms. Additionally, we aim to ensure regulatory compliance by aligning our solution with evolving legal frameworks and industry standards. The global expansion of our blockchain-enabled cheque-clearing system is also a part of our roadmap. We envision collaboration with international financial institutions to facilitate cross-border cheque transactions, enabling faster and more secure global remittances. Furthermore, we are committed to embracing emerging technologies like the Internet of Things (IoT) and quantum-resistant cryptography to enhance the capabilities and resilience of our system. These advancements will further strengthen the security and reliability of cheque-clearing operations. By embracing this transformative technology, Indian banks can stay ahead of the curve, drive innovation, and deliver better experiences to their customers. The future of cheque clearing lies in blockchain, and it is an exciting journey that promises to reshape the Indian banking landscape. In summary, our blockchain-based cheque-clearing system offers a robust and efficient solution to the challenges faced by traditional cheque processing methods. It combines the power of blockchain, smart contracts, and advanced OCR technology to provide a secure, transparent, and streamlined cheque-clearing process. With the potential for enhanced security features, regulatory compliance, global expansion, and integration with emerging technologies, our solution sets the stage for a future where cheque clearing is revolutionized by blockchain technology in the Indian banking sector.

6. REFERENCES

1. Nakamoto, S. (2008). Bitcoin: A Peer-to-Peer Electronic Cash System. Available at: https://bitcoin.org/bitcoin.pdf
2. Swan, M. (2015). Blockchain: Blueprint for a New Economy. O'Reilly Media.
3. Tapscott, D., & Tapscott, A. (2016). Blockchain Revolution: How the Technology Behind Bitcoin is Changing Money, Business, and the World. Portfolio.
4. Raval, S. (2016). Decentralized Applications: Harnessing Bitcoin's Blockchain Technology. O'Reilly Media.
5. Mougayar, W. (2016). The Business Blockchain: Promise, Practice, and Application of the Next Internet Technology. Wiley.
6. World Bank. (2018). Blockchain and Distributed Ledger Technology in Finance: Challenges, Opportunities, and the Prospects for Standards. Available at: https://www.worldbank.org/en/topic/financialsector/brief/blockchain-dlt-in-finance
7. Deloitte. (2019). Blockchain in Financial Services: Regulatory Landscape and Future Challenges for its Commercial
8. Accenture. (2019). Banking on Blockchain: Charting the Progress of Distributed Ledger Technology in Financial Services. Available at: https://www.accenture.com/_acnmedia/PDF-96/Accenture-Banking-on-Blockchain-Report-2019.pdf
9. International Monetary Fund. (2018). Fintech and Financial Services: Initial Considerations. Available at: https://www.imf.org/~/media/Files/Publications/FTC/2018/FTCI2018016.ashx
10. Harvard Business Review. (2017). The Impact of Blockchain Goes Beyond Financial Services. Available at: https://hbr.org/2017/05/the-impact-of-blockchain-goes-beyond-financial-services