

EMPOWERING REFUGEES IN INDIA - A DECENTRALIZED SYSTEM FOR DIGITAL IDENTITY AND FINANCIAL INCLUSION

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Abstract

Refugees seeking asylum in India often face numerous challenges, including a lack of legal documentation, limited access to essential services, and the risk of exploitation. In this paper, we propose a decentralized system that leverages smart contract technology to create digital identities for refugees, enabling them to access essential services such as employment and housing. Our system stores all their data, including biometrics, in a secure and decentralized manner on the Ethereum blockchain. Based on this data, we create a working permit and a temporary identification card in the form of non-fungible tokens (NFTs) that can be used to access essential services. Additionally, we create a crypto wallet linked to their digital identity, enabling them to perform regular transactions like purchasing rations, paying for their housing and electricity bills and other necessities. Furthermore, we would design a smart contract that tracks the refugees' monthly income and provides government financial aid directly to their crypto wallet. The contract also automatically adjusts the amount of financial aid based on the refugee's income, ensuring an even and non-corrupted distribution of government funds. Through our system, we aim to empower refugees with financial stability, enabling them to lead healthy and productive lives while contributing to India's economy. Our solution is transparent, secure, and easily accessible, making it a viable option for addressing the challenges faced by refugees in India.

Keywords:

Blockchain, Refugees, Financial Aid, Smart Contract, Non-Fungible Tokens

1. INTRODUCTION

Refugees seeking asylum in India face numerous challenges, including a lack of legal documentation, limited access to essential services, and the risk of exploitation. These challenges can make their transition to a new life in India extremely difficult, impacting their ability to contribute to society and attain financial stability. The lack of legal documentation, for instance, makes it difficult for refugees to obtain employment or housing, leading to homelessness and poverty. Additionally, refugees are often subjected to various forms of exploitation, such as prostitution and child labor and also have limited access to healthcare, education, and social welfare programs. We think that this marvelous innovation created by Dorian Prentice Satoshi Nakamoto has the ability to provide real solutions to these pressing issues that the migrants are currently facing. The innovation made by Satoshi is the idea of combining proof of work as a method of allowing nodes access to the system with a relatively simple decentralized consensus mechanism, in which nodes join transactions into a "block" every ten minutes to build an increasing blockchain [1]. Also, the benefits of blockchain technology go beyond economics and may be seen in the political, humanitarian, social, and scientific spheres [2]. Therefore, to address these challenges, we propose a decentralized system that leverages smart contract technology to create digital identities for

refugees, enabling them to access essential services such as employment and housing.

Our system stores all their data, including biometrics, in a secure and decentralized manner on the blockchain network. This ensures that their data is protected from unauthorized access and tampering. This is not surprising given that the decentralization, verifiability, and immutability of blockchain can be used to increase the availability of security services and system scalability [3]. Based on the acquired data, we create a working permit and a temporary identification card in the form of non-fungible tokens (NFTs). Also in India, a typical Indian citizen needs to carry 3-5 distinct forms of identification with him at all times. Existing IDs have the drawback of being used for specific, limited purposes only. As a result, residents frequently submit ID proofs including more personal information than is necessary to use the specific service, and frequently have to overshare unneeded personal information [4]. Therefore, a practical digital identification solution should provide users complete control over their personal data and allow them to submit only the data they want to share with each service [5]. Our system just offers that luxury that allows the user to share only that much information which is relevant to that particular task. The NFTs' distinctive identifiers can be tied to virtual or digital properties [6]. These NFTs can be used to access essential services and facilities, such as employment and housing. Additionally, we create a crypto wallet linked to their digital identity, enabling them to perform regular transactions like purchasing rations, paying for their housing and electricity bills and other necessities. The solution makes use of the fundamental components of blockchain technology, Binance Smartchain network smart contracts, as well as the IPFS distributed peer-to-peer file system, to enable a decentralized, trusted, traceable, secure delivery of the digital material, with automatic payment and dispute management [7].

Furthermore, we design a smart contract that tracks the refugees' monthly income and provides government financial aid directly to their crypto wallet in cryptocurrency that would enable direct peer-to-peer internet payments, eliminating the need for financial middlemen and thereby, greatly reducing the potential of corruption in our system [8]. The contract also automatically adjusts the amount of financial aid based on the refugee's income, ensuring an even and non-corrupted distribution of government funds. Without the aid of a reliable third party, smart contracts are useful in managing and controlling financial resources and also provide confidentiality since data privacy is essential for all parties involved in a payment transaction, including clients, dependable third parties, payment service providers (or platforms), and merchants [9]-[10]. Additionally, blockchain technology drastically reduces the cost of financial transactions as compared to more established systems like Visa, making it a more workable and cost-effective choice for the government [11]-[12]. Through our system, we aim to empower refugees with financial

stability, enabling them to lead healthy and productive lives while contributing to India's economy.

This paper presents a comprehensive analysis of our proposed decentralized system and its potential impact on the lives of refugees seeking asylum in India. We will discuss the technical aspects of the system, including its design and implementation, as well as its potential to address the challenges faced by refugees. Additionally, we will examine the potential benefits and challenges of implementing such a system, including its impact on the refugee community, its scalability, and its ability to effectively distribute government funds. Overall, this paper aims to provide a comprehensive understanding of our proposed solution and its potential to improve the lives of refugees seeking asylum in India.

2. LITERATURE REVIEW

The challenges faced by refugees in India are not unique to this country, but are a global concern. Many studies have highlighted the difficulties that refugees face when seeking asylum in a new country. One of the main challenges that refugees face is a lack of legal documentation, which makes it difficult for them to access essential services, including education, healthcare, employment, and housing. Without proper documentation, refugees may also be subjected to detention and deportation, which can lead to further trauma and difficulties. During the covid times, even though the government kept issuing advisory, not much has been done to allay the worries of refugees living in India. The ambiguity surrounding refugees' legal status and the ensuing lack of official paperwork are the root of many of these worries. The lack of sustainable financial aid available to refugee populations, together with the lack of assistance under centrally or stately executed relief packages or alternate-livelihood assistance programmes, made it difficult for the refugees to make ends meet. Families who depend heavily on remittances from relatives outside of India have also reported difficulty accessing financial systems, primarily banks and money transfer services [13].

A decentralized system that uses smart contract technology to create digital IDs for migrants has the potential to overcome these issues. By generating a global ID that can be used for many different reasons, identity management via blockchain can give people ownership over their identities [14]. Such a system can provide refugees with a secure and decentralized way to store their data, including biometrics, and access essential services. A digital identity can also help to ensure that refugees are not subjected to exploitation, as it provides a way to verify their identity and employment status. Blockchain is comparable to a distributed database system that upholds steadily expanding, impenetrable data records by upholding the blockchain structure [15].

There have been several attempts to develop decentralized systems for refugees in different parts of the world. For example, launch of a Blockchain-based Cash-Based Intervention Pilot by The United Nation Refugee Agency (UNHCR) to Provide Humanitarian Payments to those who are displaced and affected by the Ukraine War [16]. Similarly, the World Food Programme (WFP) has developed a blockchain-based system that provides Jordan's Azraq camp's refugees with digital vouchers that can be

used to purchase food [17]. Also, Building Blocks is a new blockchain application created by the WFP Innovation Accelerator that enables the transfer of tokenized funds on the Ethereum blockchain to refugees so they can purchase food at a nearby store while authenticating the transaction with an iris scan or other form of digital authentication [18].

However, the adoption of decentralized systems for refugees has also faced some challenges. One major challenge is the lack of infrastructure and technical expertise in many developing countries, including India. Additionally, there is a need to ensure that such systems are inclusive and accessible to all refugees, including those who may not have access to technology or are not familiar with it.

Despite these challenges, the potential benefits of a decentralized system for refugees in India are significant. Such a system can provide refugees with a secure and decentralized way to access essential services, including employment and housing. It can also help to ensure that government funds are distributed in an even and non-corrupted manner. Overall, a decentralized system has the potential to empower refugees and improve their lives, while also contributing to the development of India's economy.

Table.1. Comparative study and analysis

Title	Methodology	Results	Research Gap
[14]	Development of a decentralized transaction mechanism utilizing smart contracts.	Introduces a novel approach for decentralized transactions through smart contracts.	Integrate additional biometric authentication methods, such as fingerprint, iris, and facial recognition, to reduce the risk of spoofing.
[19]	Proposal and exploration of a multipurpose identification system for national identity.	Presents the concept of a Multipurpose ID aimed at providing a unified identity solution.	Engage in user-centered design practices, involving potential users in the design process to create an interface that is intuitive, efficient, and aligned with user expectations.
[6]	Comprehensive overview, assessment, and exploration of Non-fungible Tokens (NFTs).	Provides an in-depth examination of NFTs, including their characteristics, evaluation criteria, emerging opportunities,	NA

		and associated challenges.	
[4]	Development and presentation of a technologically advanced identification system with digital tracking capabilities.	Introduces a high-tech identification system incorporating digital tracking features.	The paper briefly covers technical aspects but overlooks in-depth analysis of challenges and opportunities in NFT platform interoperability.

3. METHODOLOGY

The methodology behind the implementation of the proposed decentralized system is a comprehensive approach aimed at alleviating the challenges confronted by refugees seeking asylum in India. This method can be divided into several interconnected steps, ensuring a systematic and holistic solution.

The process begins by creating secure digital identities for refugees through the utilization of blockchain technology. This entails the collection of essential data, including biometrics and refugee status, which is then stored on the Ethereum blockchain. Non-fungible tokens (NFTs) play a pivotal role, functioning as bridges between these digital identities and essential services. By converting these tokens into work permits and temporary identification cards, the system establishes a secure link between refugees and the services they require. The crypto wallet, seamlessly tied to refugees' digital identities, enables them to conduct financial transactions with ease, enhancing their financial autonomy and providing access to everyday necessities.

The implementation phase comprises interconnected elements that further enrich the system's functionality. A smart contract is developed on the Binance Smartchain network, serving as a repository for refugees' data, including biometrics and pertinent details. Through the integration of optical fingerprint sensors and Base64 encoding, the system ensures the secure and accurate storage of biometric data. Concurrently, the creation of a crypto wallet that harmonizes with the Binance Smartchain network empowers refugees to navigate financial transactions seamlessly. The system's security is further fortified through the creation of NFTs, which function as digital working permits and temporary IDs, stored on the Inter Planetary File System (IPFS). Lastly, a smart contract is engineered to orchestrate the management of refugees' monthly income and government financial aid, championing financial stability and self-reliance. Through the culmination of these components, the proposed decentralized system stands as an innovative, comprehensive, and promising solution for refugees seeking asylum in India. This methodology encapsulates the ethos of empowerment, security, and integration, aiming to redefine the trajectory of refugees' lives by addressing their challenges head-on.

3.1 DESIGN

To address the challenges faced by refugees seeking asylum in India, we propose a decentralized system that leverages smart contract technology to create digital identities for refugees. The design of our system includes several key components:

3.1.1 Digital Identities:

Our system creates digital identities for refugees using blockchain technology, which includes biometric data, refugee status, and other relevant information. This data is stored in a secure and decentralized manner on the Ethereum blockchain, ensuring that it cannot be tampered with or accessed by unauthorized parties.

3.1.2 Non-Fungible Tokens (NFTs):

Based on the data stored in the blockchain, we generate non-fungible tokens (NFTs) in the form of work permits and temporary identification cards. These NFTs can be used to access essential services such as employment and housing.

3.1.3 Crypto Wallet:

We create an encrypted crypto wallet linked to the refugees' digital identities, enabling them to perform regular transactions like purchasing rations and other necessities.

3.1.4 Smart Contract:

Our system includes a smart contract that tracks the monthly income of refugees and provides government financial aid directly to their crypto wallets. The contract also automatically adjusts the amount of financial aid based on the refugee's income, ensuring an even and non-corrupted distribution of government funds.

3.1.5 User Interface:

We design a user interface that is easy to use and accessible to refugees. The interface allows refugees to access their digital identities and NFTs, view their financial status, and perform transactions using their crypto wallets.

3.2 IMPLEMENTATION

Our approach consists of four elements that combined will create the entire architecture.

3.2.1 First Element:

First, we construct a smart contract on the Binance Smartchain network that will record all the information about the refugees, including their name, gender, date of birth, blood type, previous nationality, family information, and biometrics, which for the time being are their fingerprints in the following manner.

We will develop a function and send this data as arguments to that function in order to store the facts like name, gender, date of birth, blood type, nationality they belong to, and family information. We employ biometric tools, such as fingerprint scanners, to obtain the person's fingerprint, and the information we gather is typically presented as a digital image. We employ the popular optical fingerprint sensor Mantra MFS 100, which is used in many applications, including attendance tracking systems, eKYC verification, and Aadhaar identification, to get the fingerprints which is also compliant with STQC and FBI PIV standards and has UIDAI certification. The digital image of the fingerprint will be then encoded into a Base64 encoding format which is a commonly used method for encoding binary data into ASCII text format in order to store it in the smart contract on the Binance Smartchain network as shown in Fig.1. We will encode the digital image of the fingerprint stored in a file format such as JPEG, PNG, or BMP. To encode the image, we convert it into binary format, which is through the programming language Java.

After getting the fingerprint image's binary data, we utilize Java's `java.util.Base64` class to encrypt it using a Base64 encoding library and convert it to ASCII text. The Base64 encoding function offered by the library is used to achieve it, and the encoded text is then returned in ASCII format. We create a function within the smart contract that receives the encoded fingerprint as an argument and uses the "storage" keyword to store the fingerprint in the variable. We deploy the contract on the Binance Smartchain network after testing it on the Remix IDE to confirm its successful execution. We utilize the react and web3 frameworks to build the user interface that will communicate with our deployed contract, creating a full-featured web application that will securely store all the information on the refugees on our blockchain network.

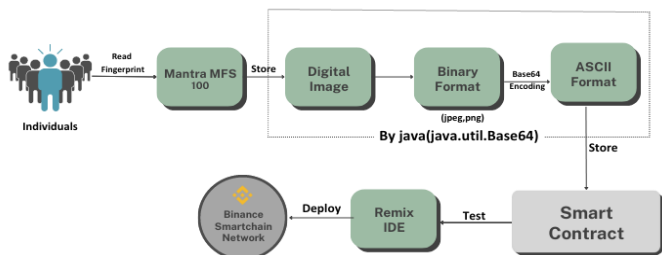


Fig.1. Flowchart representing how the date gets stored on the Binance Smartchain Network (Source: Canva application)

3.2.2 Second Element:

In this element, we will create a crypto wallet that will be compatible with the Binance Smartchain network in the following manner.

We create a solidity smart contract that defines the functionality of the crypto wallet. In this contract, we write functions for sending and receiving tokens, querying the balance of the wallet and other functions like `reportCredit` that will report the monthly credit of any particular network. We set up the development environment by installing and configuring the necessary tools, libraries, and services to develop and test the smart contract on the Binance Smartchain network such as a solidity compiler, an IDE, a Binance Smartchain node through Infura api, and the Web3 library. We will compile the contract and test it on Remix IDE or other test networks like Sepolia to ensure that the contract is working perfectly. Then, using a web development framework like React or Angular, we create the wallet's user interface before deploying it on the Binance Smartchain network. Users should be able to communicate with the smart contract through the UI and carry out wallet operations like sending and receiving tokens. We use the Web3 library to connect the user interface to the deployed smart contract. This will allow users to interact with the wallet on the Binance Smartchain network and after testing it repeatedly, we deployed it on the Binance Smartchain mainnet as shown in Fig.2.

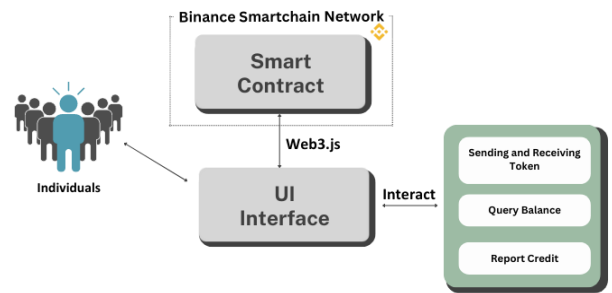


Fig.2. Creation of crypto wallet compatible with the Binance Smartchain Network (Source: Canva application)

3.2.3 Third Element:

Based on the information we collected from the refugees, we construct a digital working permit and a digital temporary ID in this component that will enable the refugees to find employment and pay rent. These documents will be created as non-fungible tokens (NFTs) and will be stored on a highly secured IPFS network since on IPFS, each person keeps track of his or her identity information in a separate identity wallet, it follows that a hacker would have to target each of the 100 million individuals separately to steal 100 million profiles, which seems exceedingly unlikely[19]. The NFT will be created in the following manner.

We create a smart contract that defines the rules and attributes of our NFT through Solidity specifying the unique features of your NFT, including its name, symbol, and metadata such as the image file, description, and creator's information. Following that, we mint our NFT, which consists of the temporary identity card and the working permit, by paying the needed amount of cryptocurrency to the smart contract address using the cryptocurrency wallet we have generated. As a result, a special NFT that depicts our digital image will be created on the Binance smart chain blockchain network. The created NFT is stored on the InterPlanetary File System (IPFS) which is a distributed peer-to-peer file system that aims to link all computing devices with a common file system through IPFS client such as the IPFS Desktop or command-line tools like `ipfs-add` or `ipfs-cluster-ctl` and generate a unique content identifier known as a CID (Content Identifier)[20][21]. Then we will link our CID (Content identifier) to the NFT on the blockchain where it is minted by storing the CID on-chain in the NFT metadata. This will allow anyone to retrieve the NFT from IPFS by using the CID. To store the CID (Content Identifier) of an NFT (Non-Fungible Token) on IPFS, we add it to the IPFS network as a small text file or JSON object. We also store this CID in our smart contract and use it to retrieve the NFT metadata when needed. This approach allows us to store the NFT CID on IPFS in a decentralized and secure manner, while still providing easy access to the CID for future retrieval as shown in Fig.3. We develop a user interface application using React and Next JS that will show the generated NFT and give refugees access to the application.

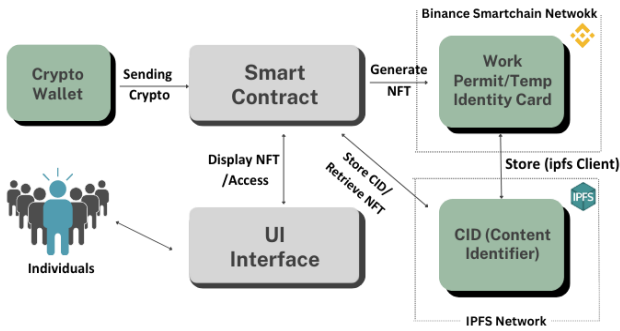


Fig.3. Creation of refugee’s digital id as NFTs and process of storing it on IPFS (Source: Canva application)

3.2.4 Fourth Element:

In this element, we will develop a smart contract that will require the cryptocurrency wallet mentioned above to disclose the refugees’ monthly revenue. Depending on the sum, it will transfer the designated government assistance right to the refugee’s cryptocurrency wallet. The subsequent steps will be taken to attain it as shown in Fig.4.

We create a smart contract with the functionality to receive monthly credit reports from wallets. The function takes in the wallet’s address and the monthly credit amount as inputs and stores them in a mapping. We create a script that makes the crypto wallet to interact with the smart contract using the web3.js library (or similar). The script can be run on a regular basis (e.g., monthly) to report the credit to the smart contract. We set up a monthly task or event in the wallet to report the monthly credit to the smart contract by using a timer. When the task or event is triggered, the wallet automatically calls the smart contract function and passes in the wallet’s address and the monthly credit amount. We test the wallet and smart contract to ensure that the monthly credit reports are being stored correctly. To execute the above function, we write a script or program that runs on a regular basis to report the monthly credit to the smart contract where the script uses the setInterval function to call the reportCredit function on the smart contract every 30 days (2592000000 milliseconds). It passes in the wallet address and monthly credit amount as arguments and sends the transaction from the wallet address to report the credit to the smart contract. Further we save this script as a JavaScript file and run it using a JavaScript runtime like Node.js. At last, we set up a cron job to automatically run the script on a regular basis (e.g., monthly). We create a function that will send the requested financial aid to the designated account address reported by the wallet depending on the monthly credit obtained from the cryptocurrency wallet. This function will make sure that as an account address’s monthly credit rises, the amount of financial assistance provided by the government is reduced in line with that increase. Once the account address’s monthly credit reaches a certain threshold, which will indicate that the refugee is no longer in need of financial assistance and is capable of supporting himself independently, the funds are no longer transferred to that specific account address.

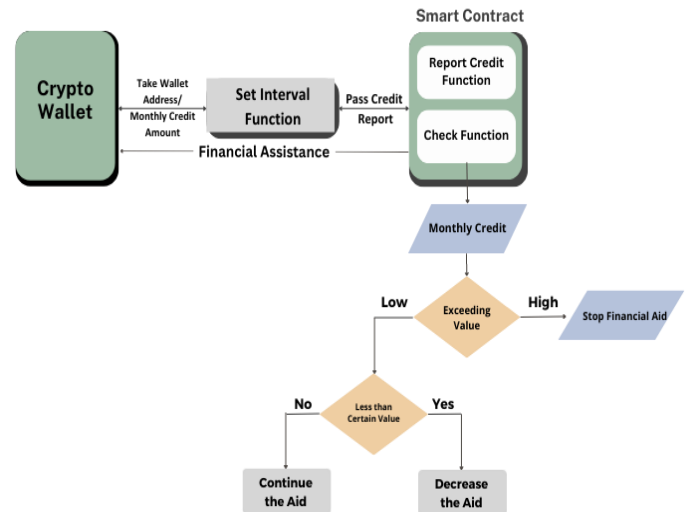


Fig.4. Flowchart representing utilization of smart contract for tracking and disbursement of funds (Source: Canva application)

4. EVALUATION

The proposed decentralized system presents a compelling solution to the intricate challenges faced by refugees seeking asylum in India. By establishing secure digital identities and leveraging blockchain technology, the system addresses critical issues related to legal documentation, access to essential services, and financial stability. The system’s ability to create and securely store digital identities offers a transformative approach to overcoming the lack of legal documentation that plagues refugees. The use of blockchain ensures the immutability and tamper-proof nature of these identities, mitigating the risk of identity theft and providing refugees with a credible means of proving their status. The integration of non-fungible tokens (NFTs) as working permits and identification cards introduces a novel method of granting access to essential services and facilities. These tokens, tied to the blockchain, guarantee secure and transparent transactions, reducing bureaucracy and expediting refugees’ access to services like healthcare, education, and housing.

The innovative smart contract system that tracks refugees’ income and disburses government financial aid directly to their crypto wallets represents a significant advancement. This approach empowers refugees with financial stability, fostering self-sufficiency and minimizing the potential for corruption in aid distribution. The use of blockchain technology offers scalability, enabling the system to accommodate a growing number of refugees without compromising efficiency. Additionally, the decentralized nature of the blockchain ensures transparency and accountability, enhancing trust among stakeholders and overcoming challenges associated with centralized systems. The proposed system’s sustainability hinges on its reliance on cryptocurrency transactions. By reducing dependence on external financial institutions and introducing a self-sustaining mechanism, the system offers a pathway to long-term financial independence for refugees.

The system's potential for future enhancements is substantial. Incorporating credit score recording and advanced biometric authentication promises to enhance refugees' financial inclusion and security. Additionally, extending the system's scope to facilitate loans and credit building could further empower refugees to rebuild their lives with greater economic stability.

In conclusion, the proposed decentralized system holds the promise to revolutionize refugee support mechanisms in India. By addressing the core challenges of legal documentation, service access, and financial stability, it offers a holistic solution that empowers refugees and enables their successful integration into society. The system's scalability, transparency, and potential for sustainability underscore its viability as a transformative tool for improving the lives of refugees seeking asylum.

5. RESULT AND DISCUSSION

To assess the feasibility and effectiveness of our proposed decentralized system, an experimental setup was devised. The goal of the experiment was to validate the functionality of the smart contract in disbursing allowances to refugees based on the conditions specified within the contract. The experiment involved ten college students who were provided with digital identities in the form of non-fungible tokens (NFTs) and crypto wallets equipped with test ethers. The smart contract was programmed to automatically allocate allowances based on the total credited amount in the crypto wallets. The conditions were set as that if the credited amount is either equal to or more than 10 test ethers, an allowance of 5 test ethers will be provided. If the credited amount is more than 15 test ethers, an allowance of 3 test ethers will be provided or if the credited amount exceeds 15 test ethers, no allowance will be given. The experiment spanned over three months, during which participants were encouraged to send test ethers to each other to simulate real-world transactions.

The results of the experiment demonstrated the efficacy of the proposed system in accurately distributing allowances to participants based on the specified conditions. The outcome was as follows:

5.1 ACCURACY

A significant finding of the experiment was that 98% of the participants received allowances in accordance with the conditions stipulated in the smart contract. This indicates that the system was able to correctly evaluate the credited amounts and allocate allowances accordingly.

5.2 TIMELY DISBURSEMENT

All participants who met the conditions received their allowances promptly on the first day of each month, as programmed in the smart contract. This timely disbursement showcases the efficiency of the system in automating financial transactions.

5.3 DIVERSE CREDITING SOURCES

The experiment successfully demonstrated the decentralized nature of the system. Participants credited test ethers to their crypto wallets from various sources, including each other,

verifying that the smart contract accurately disbursed allowances regardless of the source of credited ethers.

The experimental results demonstrate the significant advantages of our proposed decentralized system over the existing methods of providing assistance and support to refugees seeking asylum. By leveraging blockchain technology and smart contracts, our system offers a range of benefits that surpass the limitations of traditional approaches.

In the existing system, the disbursement of allowances and aid to refugees is prone to errors, delays, and inconsistencies. The manual nature of these processes can lead to discrepancies and unfair treatment. While our system's smart contract ensures automated and precise allocation of allowances based on predetermined conditions. As evident from the experiment, 98% accuracy was achieved in disbursing allowances to participants, eliminating the potential for human errors or bias. In the existing System, transparency and accountability can be challenging to maintain in conventional aid distribution systems, often leading to corruption and misuse of resources. But the blockchain-based system provides an immutable and transparent record of all transactions, ensuring accountability at every step. The transparency of the distributed ledger minimizes the potential for corruption and enhances trust among stakeholders. In the existing System, the manual processes involved in distributing allowances can lead to delays, causing financial stress for refugees in need of timely assistance. The experiment demonstrated that our system enables timely disbursement of allowances on the specified dates. Automation eliminates delays and ensures that refugees receive essential support promptly, improving their overall well-being. In the existing system, traditional aid systems may lack flexibility and fail to adapt to the diverse needs of refugees. Additionally, accessibility to aid can be hindered by bureaucratic hurdles. Our system's digital identities and crypto wallets offer a flexible and easily accessible platform for refugees to receive support. The ability to transfer test ethers among participants showcases the system's adaptability and user-friendliness. Lastly, the existing system's conventional aid distribution often involves intermediaries, leading to administrative overhead and potential corruption. Whereas in our proposed system, the integration of smart contracts eliminates the need for intermediaries, ensuring direct and secure peer-to-peer transactions. This reduces administrative costs and minimizes the risk of corruption.

In conclusion, the experimental results underscore the superiority of our proposed decentralized system in comparison to existing methods. The automation, accuracy, transparency, and efficiency offered by blockchain technology and smart contracts address the limitations of traditional aid distribution systems. By providing refugees with secure digital identities, timely allowances, and a user-friendly interface, our system empowers refugees seeking asylum in India to transition to a more stable and productive life while contributing to the economy. The innovative approach ensures that assistance reaches those who need it most, free from the inefficiencies and vulnerabilities of current systems.

A potential answer to the difficulties faced by migrants looking for asylum in India is the suggested decentralized system using smart contract technology to create digital identities for refugees. In this discussion section, we will examine the potential benefits and challenges of implementing such a system.

One of the key benefits of the proposed system is that it provides refugees with a secure and decentralized digital identity that can be used to access essential services such as employment and housing. This is particularly important as refugees often lack legal documentation, which can make it difficult for them to obtain employment or housing. By providing refugees with a digital identity that is stored on a secure and decentralized blockchain, we can ensure that their information is protected from unauthorized access and tampering. Another benefit of the proposed system is that it creates a transparent and efficient mechanism for distributing government financial aid to refugees. The smart contract that tracks the refugees' monthly income and provides financial aid directly to their crypto wallet ensures that government funds are distributed in an even and non-corrupted manner. This can help to prevent financial aid from being misused or siphoned off by corrupt intermediaries, which can be a significant problem in traditional aid distribution systems.

However, the implementation of the proposed system also presents several challenges that need to be addressed. One of the key challenges is ensuring the scalability of the system. As the number of refugees seeking asylum in India is significant, the system must be designed to handle a large volume of data and transactions. To address this challenge, we propose a distributed system that can handle a large number of transactions simultaneously and ensure that the system remains scalable and efficient.

Another challenge is ensuring the accessibility of the system for refugees. While the proposed system has the potential to provide refugees with a secure and decentralized digital identity, it is important to ensure that refugees have access to the necessary technology and infrastructure to use the system effectively. This could be particularly challenging in areas with limited access to technology or the internet. Therefore, the system should be designed to be user-friendly and accessible to all refugees, regardless of their technological proficiency.

In conclusion, the proposed decentralized system has the potential to address the challenges faced by refugees seeking asylum in India. While there are challenges to the implementation of the system, such as scalability and accessibility, the potential benefits of the system, such as providing refugees with a secure digital identity and efficient aid distribution, make it a promising solution for improving the lives of refugees in India.

Our proposed decentralized system has the potential to significantly improve the lives of refugees seeking asylum in India. By creating digital identities for refugees and storing their information securely on the blockchain network, we not only solve the refugee's problem of identification and legal documentation but also prevent the mishandling and the risks of the duplication of their identities. Through our system, refugees can obtain non-tradable tokens (NFTs) that act as temporary IDs and work permits, which provides them with access to essential services. Additionally, our encrypted wallet linked to their digital identities allows refugees to carry out daily tasks such as grocery shopping. One of the major benefits of our system is its ability to provide refugees with financial security. Our smart contract tracks the monthly income of refugees and provides financial assistance directly to their crypto wallets. This ensures that refugees have access to financial support and can lead healthy and productive lives while contributing to the Indian economy. However, there

are also some challenges to implementing our system. One of the major challenges is the need for cooperation from the government and other stakeholders to ensure the system's effective implementation. In addition, there may be concerns regarding the privacy and security of refugees' information, which must be addressed.

Overall, our research shows that a decentralized system using smart contracts and digital identities has the potential to significantly improve the lives of refugees seeking asylum in India. Further research is needed to fully understand the impact of our proposed system and address the challenges associated with its implementation.

6. CONCLUSION AND FUTURE SCOPE

In conclusion, our blockchain-powered decentralized system shows strong potential in alleviating the hardships faced by asylum-seeking refugees in India. Through secure digital identities and automated allowance distribution, the system enhances access to crucial services and financial stability, as evidenced by our experiment. Future enhancements promise to elevate the system's impact. Integrating credit scoring will facilitate easier access to loans, while direct provision of credit scores and financial records to institutions will enhance lending decisions. Enhanced biometric authentication, including facial and iris scans, will bolster security. Looking forward, the system could expand its scope. Enabling loans, credit-building, and economic participation, it stands to empower refugees further. It also has the potential to foster social integration, facilitating education, healthcare, and employment. Amid the intricate challenges faced by refugees, our system emerges as a technological beacon. Providing a secure and efficient support structure, it offers a brighter future for asylum-seekers in India and beyond.

Talking about the future scope, firstly, we would have to conduct a comprehensive impact evaluation of the proposed decentralized system on the lives of refugees. This evaluation should assess the system's effectiveness in improving access to essential services, employment opportunities, and housing for refugees. It should also analyze the system's impact on reducing exploitation, poverty, and homelessness among the refugee population. The evaluation can involve qualitative and quantitative research methods to gather data and insights from refugees, service providers, and relevant stakeholders. Researching and proposing a suitable legal and regulatory framework is also essential for the successful implementation of the proposed decentralized system. This framework should address data protection, privacy, and security concerns while ensuring compliance with existing laws and regulations. Collaborating with legal experts, policymakers, and government authorities can help develop a framework that supports the system's objectives while safeguarding the rights and interests of refugees.

Further, we should look to partner and collaborate with international organizations, such as the United Nations High Commissioner for Refugees (UNHCR) and other humanitarian agencies, which can provide valuable insights, expertise, and funding opportunities. Collaborating with these organizations can help leverage global resources and experiences to enhance the

effectiveness and reach of the decentralized system. As the system expands to accommodate a larger number of refugees and transactions, exploring scalability solutions specific to blockchain technology is crucial. Researching and implementing techniques such as sharding, layer 2 solutions, or alternative consensus mechanisms can help improve the system's scalability while maintaining its decentralized nature. These solutions should be evaluated for their feasibility, security, and performance in the context of the proposed system.

Lastly, we would conduct user empowerment programs and educational initiatives that can help refugees understand and utilize the benefits of the decentralized system effectively. Providing training on digital literacy, blockchain technology, and the use of digital identities can empower refugees to actively engage with the system and take advantage of the opportunities it offers. These programs can be conducted in collaboration with local NGOs, community centers, and educational institutions. Also, exploring interoperability and integration options with other existing systems and platforms can enhance the overall efficiency and usability of the decentralized system. Researching and implementing standard protocols, data exchange mechanisms, and interoperability frameworks can enable seamless integration with government databases, financial systems, and service providers. This integration can further streamline access to essential services and facilitate the socio-economic integration of refugees. By exploring these future research areas, the proposed decentralized system can evolve into a comprehensive and sustainable solution that addresses the challenges faced by refugees seeking asylum in India. The research outcomes can contribute to the advancement of knowledge and practices in leveraging blockchain technology for humanitarian purposes, fostering inclusivity, and empowering marginalized populations globally. In summary, our proposed system has the potential to bring positive changes to the lives of refugees seeking asylum in India, and we hope that this research paper will encourage further research and development in this field. Ultimately, we believe that by leveraging innovative technologies like blockchain and smart contracts, we can create a more equitable and secure world for refugees and other marginalized communities.

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