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Blockchain-based solution for addressing refugee management in the Global South: transparent and accessible resource sharing in humanitarian organizations

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1 Introduction

NGOs can foster a more inclusive and effective civil society in the Global South by collaborating to elevate the voices of marginalized populations. To realize positive impacts, non-governmental organizations (NGOs) should cultivate robust connections with local communities while advocating for their requirements. As Sandri (2018) points out in his article, "Humanitarian aid to refugees in the Jungle refugee camp of Calais necessitates diverse resources," including housing, food, healthcare, and education, highlighting the obligation toward humanitarian assistance. An ensuing study estimates that by 2024, approximately 117.2 million people will be displaced worldwide, mainly in countries exposed to climate change (Global Trends report 2023, n.d.). This scenario has rendered the challenges faced by refugees progressively intricate and demanding. In response, a comprehensive policy is essential to ensure equitable global responsibility. Blockchain technology can present innovative solutions to assist marginalized individuals, such as facilitating peer-to-peer crowdfunding and ensuring secure digital storage of identity documents. Nonetheless, assessing these technological advancements' ethical and logistical ramifications is vital while protecting refugees' privacy and rights. A resilient digital identification system could be crafted through blockchain technology to aid refugees in overcoming common identification obstacles. However, the practicality of such a blockchain solution might be constrained for refugees in regions with limited access to technology or stable internet connectivity, possibly rendering it inadequate for them.

Furthermore, some refugees may lack the knowledge or resources to navigate and utilize a sophisticated digital identification system. For example, the absence of internet infrastructure could hinder a refugee residing in a remote camp from accessing the blockchain system, obstructing their ability to verify their identity and obtain essential services. Zwitter et al. (2020) discovered that refugees residing in urban settings with better connectivity and resources could find the blockchain system more accessible and beneficial for establishing secure identification. As he highlighted in his article, this system may include vital documents like diplomas, health records, and birth certificates to aid refugees in rebuilding their lives. While integrating essential documents may prove advantageous, it fails to tackle the underlying issue of internet connectivity and access in remote areas, which continues to be a significant barrier to implementing an advanced digital identification system, as noted by other researchers such as Ager and Strang (2008). Connectivity hurdles may delay the deployment of blockchain-based identification systems in more isolated locations. The research focuses on traditional refugee management strategies while illuminating future developments in refugee management systems, particularly regarding aid and assistance delivery. It's crucial to recognize that individuals

in these regions may need help utilizing such systems due to limited access to dependable connectivity.

Additionally, an over-reliance on online verification procedures can disproportionately impact marginalized communities that struggle with consistent internet access. Moreover, privacy and security concerns may arise from storing sensitive personal information on a blockchain platform. Despite these obstacles, blockchain-based identification systems can help prevent identity theft, streamline bureaucratic procedures, and provide stability and security for displaced individuals. A report from the Internal Displacement Monitoring Centre (IDMC) in Geneva emphasizes the urgent need to focus on the needs of Global South countries. It highlights the importance of equipping them with the resources required to assist the increasing number of refugees, reaching an unprecedented 71 million individuals internally displaced worldwide (All-time high of 71 million people internally displaced worldwide, 2023). Addressing the underlying causes of displacement and pursuing sustainable solutions is critical.

A researcher highlighted that the publication titled "Civil Society and Social Integration of Asylum Seekers: The 'Strength of Weak Ties' and the Dynamics of 'Strategic Action Fields'" presents a compelling argument for a decentralized approach to addressing the challenges faced by asylum seekers. The researcher emphasized that this approach should prioritize transparency and accessibility as essential elements. Civil society organizations can enhance collaboration and resource sharing by promoting open communication and creating environments where resources are readily available. This, in turn, could facilitate the integration of asylum seekers into communities, leading to more effective support systems and improved social cohesion (Olsson et al., 2023). This method promotes collaboration among stakeholders and enhances community ownership of resources. Cole et al. (2019) noted that blockchain technology can effectively manage and distribute resources to refugees due to its immutability and security. By establishing a permanent record of funds designated for refugees, aid can be allocated more efficiently and reliably. Additionally, direct peer-to-peer transactions reduce reliance on intermediaries, thereby lowering the chances of corruption and fraud (Ashurst et al., 2021). Advances in technology have strengthened trust in individual donations while boosting transparency and accessibility. Blockchain technology can also significantly improve the distribution and tracking of food and supplies in refugee camps within developing nations, providing refugees access to vital resources necessary for integrating into their new communities. However, challenges like inefficient resource sharing, accessibility, and inadequate support for refugees must be addressed through inclusive strategies that involve translation services, cultural sensitivity training, and access to essential services such as healthcare and education (Ab. Wahab, 2018). Successful refugee integration requires collaboration among various stakeholders, including governments, humanitarian organizations, local communities, tech firms, and NGOs.

The decentralized framework for refugee management allows for more direct communication and collaboration between refugees and aid organizations, as Sydow et al. (2020) points out. This setup can notably reduce the time needed to assist those in need. Furthermore, a decentralized system can streamline resource distribution, ensuring that aid reaches the most critical areas. The comprehensive benefits of a peer-to-peer refugee management system can significantly enhance the effectiveness and impact of humanitarian efforts, as highlighted by researchers (Shi et al., 2020). It is vital to examine the challenges and limitations of implementing blockchain technology in refugee contexts to ensure its successful application. Collaborating with key stakeholders is essential for making informed choices while prioritizing privacy and security concerns.

Moreover, enhancing the welfare of refugees through effective resource distribution is paramount. Collaborative approaches utilizing blockchain technology are vital in preventing theft and mismanagement. By adopting blockchain, organizations can enhance their efforts by precisely monitoring aid program effectiveness and impact assessment. Data analysis is crucial for making necessary adjustments, covering the number of families supported and advancements toward long-term objectives. Fostering trust and ensuring sustainable resource usage hinges on transparency and accountability, which can be achieved through independent audits and evaluations. Such assessments should identify and prevent misrepresentation, facilitate accurate activity evaluations, and enhance transparency. Ultimately, this strategy supports responsible resource utilization and builds trust among the diverse stakeholders involved in the organization.

2 Methodology

This study employs a qualitative approach to gather ethnographic research findings from literature reviews, emphasizing firsthand experiences and perspectives within a cultural context. The lack of reliable data on international migration hinders an accurate depiction of global migration patterns, allowing only for rough estimates. Furthermore, the literature review encompassing refugee management broadly emphasizes migration. This approach enables the author to explore how societal norms, and cultural backgrounds influence the perspectives and behaviors presented in the examined literature. Crisp et al. (2012), asserts that migration research requires more comprehensive, high-quality data. By immersing themselves in the studied culture, researchers can gain a deeper understanding of its complexities and nuances. With this methodology, the study thoroughly explores the cultural phenomena at hand. The research entails having individuals evaluate global organizations involved in refugee protection, like the UNHCR, NGOs, and NPOs in the global south, and then analyzing the findings for recurring themes.

Additionally, the research investigates the influence of national governments on refugees and asylum seekers, yielding valuable insights for enhancing support for vulnerable individuals by revealing power dynamics and decision-making within refugee policies. Future includes examining the relationship between blockchain data management systems and refugee politics. This approach acknowledges the significance of stakeholders' knowledge and experience in international collaboration, migration prevention, and burden-sharing. However, it also considers the potential impact of biases and personal agendas on the outcomes related to aid assistance in the global south. Thus, it is crucial to approach the literature review cautiously to attain objectivity and accuracy in future refugee management policies.

3 Challenges in refugee management

Effectively managing refugees in the Global South faces various obstacles necessitating innovative solutions. A key challenge is greater transparency in resource allocation, impacting the monitoring of distribution and accountability (Tilling, 2004). Other hurdles include poor resource distribution, accessibility issues, and inadequate refugee support. To tackle these challenges effectively, it is essential to adopt inclusive policies and practices that put the needs of refugees first. This can be achieved through methods like providing translation services, cultural sensitivity training for service providers, and ensuring healthcare facilities and schools are accessible (Ab.Wahab and Khairi, 2019). Governments and humanitarian organizations can also collaborate with local communities to establish support networks and community-driven initiatives to seamlessly integrate refugees into society. For instance, constructing ramps and elevators in public infrastructure can facilitate access to essential services for refugees with mobility challenges (Mcgrath and Young, 2019).

Moreover, community centers can be established by governments and humanitarian organizations to offer language classes, vocational training, and counseling services to refugees according UNHCR reports (Language-Learning Programme for Asylum Seekers and Refugees | The Global Compact on Refugees | UNHCR, n.d.). These initiatives will foster their integration into society and alleviate marginalization. Nonetheless, limited funding and competing priorities may obstruct the execution of such strategies, perpetuating barriers and social exclusion of refugees with disabilities (Hunter and Reece, 2022). Recognizing the distinct challenges faced by refugees with disabilities is vital, necessitating adequate resources to address their specific requirements. To build a more inclusive society, efforts must focus on integrating and empowering refugees with disabilities (Ellis et al., 2007). This entails creating equitable opportunities for engagement in societal activities, reimagining their futures, and ensuring their voices are included in decision-making.

Furthermore, accessible infrastructure must be established in refugee camps and host communities to provide refugees with disabilities equal access to vital services like healthcare, education, and employment (Asgary and Segar, 2011). Specialized health and rehabilitation services should cater to their physical and psychological needs (Hynie, 2018). Advocating for awareness and combating discrimination against refugees with disabilities is also critical. Additionally, fostering a culture of inclusion and acceptance within society is essential (Alam and Imran, 2015). Training programs and job opportunities must adapt to the specific skills and abilities of refugees with disabilities. It would be beneficial to establish a dedicated committee to address their unique needs and concerns. This committee would actively seek input from refugees with disabilities and hold regular meetings to ensure their substantial involvement in decision-making regarding relevant issues. Effectively addressing the needs of refugees with disabilities requires a holistic approach emphasizing collaboration among governments, humanitarian organizations, and local communities. Such efforts can create a more inclusive and equitable society where everyone can flourish and achieve their potential, irrespective of their abilities. However, it is essential to ensure representation from various disability groups and to coordinate efforts carefully to prevent conflicts of interest while facilitating the necessary support for refugees with disabilities.

4 Understanding blockchain technology

Initially termed "distributed ledger technology" and broadly discussed among tech enthusiasts in East and North-East Asia since the late 1990s, blockchain technology has gained tremendous traction since 2017. Scholars note a worldwide shift in how blockchain technologies play a crucial role (Shi et al., 2020). This transformation is expected to fundamentally alter production governance, bringing significant institutional implications for the global economy (Macdonald, 2013). According to Sandoz (2020), Polanyi articulated in 1944 a noteworthy transformation that integrated the logic of markets into social life, thereby creating conditions conducive to the emergence of fascism and social democracies. The advent of blockchain technology as an emerging force signifies the initiation of yet another phase of global transformation. A study conducted by Mackieson et al. (2019) revealed that over 80% of bankers anticipate the introduction of blockchain technology by the year 2020. Blockchain technology has evolved into a global phenomenon and has become a prevalent subject in public addresses, academic discourse, and informal conversations. The technology has captivated the public's imagination, with its potential applications and implications expected to expand further. Additionally, blockchain technology presents numerous advantages for monitoring inventory and supply chain operations.

By leveraging blockchain's distinct attributes, companies can enhance security, transparency, and efficiency while reducing the risks of fraud and tampering (Zubiaga et al., 2018). The decentralized nature of blockchain removes intermediaries and enables trustless transactions, making it resistant to hacking and unauthorized access. The enduring nature of transaction records promotes accountability and reliability, while smart contracts automate and streamline processes, reducing human error and administrative expenses (Zubiaga et al., 2018). However, it is essential to recognize that establishing a blockchain system requires significant investments in infrastructure, software development, and training. Small businesses with limited resources may find these systems challenging to manage, making them less feasible (Atzori, 2015).

Furthermore, effectively integrating blockchain technology into current supply chain systems can be complex and time-consuming, potentially leading to operational disruptions and delays (Ashurst et al., 2021). Nonetheless, the substantial potential benefits of using blockchain in inventory management should not be ignored (Shi et al., 2020). Companies can automate inventory management, trigger restocking when supplies fall below a certain level, and share critical data with partners in real time. This results in faster and more efficient supply chain operations, improved collaboration, and quicker decision-making (Cheng, 2021). By identifying bottlenecks or inefficiencies in the supply chain, companies can adapt promptly and optimize their operations,

leading to cost savings and improved customer satisfaction (Asi and Williams, 2018). Moreover, while adopting blockchain technology requires a considerable investment, it offers significant advantages for firms aiming to streamline their supply chain processes, enhance efficiency, and increase transparency and accountability. By carefully assessing their needs and resources, companies can determine whether blockchain is the right solution for them and take steps to implement it successfully.

5 Benefits of blockchain in humanitarian organizations

Some humanitarian organizations have raised concerns regarding the effectiveness of management assistance in refugee contexts. One promising solution could be the application of blockchain technology. Its distributed ledger system and decentralized network eliminate the need for intermediaries. As every node records all transactions, manipulation or censorship becomes challenging. This level of transparency fosters peer-to-peer interactions and instills confidence among participants. Blockchain ensures transaction validity through a verifiable record, making it increasingly appealing across various sectors due to its capacity to enhance accountability and trust. Its transparency is especially beneficial for applications requiring data integrity, such as supply chain management, identity verification, and financial transactions. Moreover, blockchain's decentralized aspect guarantees records' security and permanence. Recent scholarly studies suggest that blockchain, as a distributed ledger system functioning decentralized, can effectively address the management challenges faced by humanitarian organizations in refugee settings (Cole et al., 2019). Unlike traditional systems reliant on centralized authorities to process transactions, blockchain employs a decentralized network of nodes (Di Vaio et al., 2022). This eliminates the necessity for a single point of control, with each node retaining a complete transaction history. Such decentralization encourages peer-to-peer interactions, minimizes the risks of censorship, manipulation, and individual errors, and enhances participant trust (Alam and Imran, 2015). The transparency of blockchain allows participants to verify the legitimacy of transactions by accessing a visible and trustworthy ledger. The ability of blockchain technology to foster trust and accountability has gained significant attention in various sectors in recent years. This technology is particularly suited for applications demanding data integrity, like financial transactions, supply chain management, and identity verification, thanks to its transparency, which facilitates enhanced monitoring and auditing.

Blockchain technology serves as a transformative innovation that creates immutable records of transactions. Consequently, once a transaction is logged in the blockchain, it becomes a permanent entry that cannot be altered or removed retrospectively. This immutability is secured through cryptographic methods such as hashing alongside consensus mechanisms like proof-of-work or proof-of-stake. These protocols uphold the integrity and dependability of the data on the blockchain, effectively reducing risks related to fraud, tampering, or unauthorized alterations. The fundamental advantages of blockchain, including transparency, immutability, and security, render it a compelling choice for diverse applications. Its promise to foster trust and accountability makes it an invaluable tool for organizations and governments looking to enhance operations and mitigate the potential for fraudulent activities. A notable example is the World Food Programme (WFP), which has integrated blockchain technology into its "Building Blocks" initiative, enabling 10,000 Syrian refugees in Jordan to receive cash-based transfers via a blockchain framework. This implementation has significantly increased accountability and transparency while minimizing fraud and corruption risks. Moreover, the project has allowed WFP to abolish transaction fees typically paid to third-party financial service providers, thereby improving data protection for beneficiaries and lowering financial risk, all without altering the beneficiary experience. The initiative is anticipated to recover its costs within the 1st year. WFP aims to extend its reach to 100,000 Syrian refugees by the end of 2017 and implement full coverage for all refugees supported by WFP in Jordan by 2018.

Blockchain technology has attracted considerable interest from major multilateral organizations, notably featuring in the agenda of the World Economic Forum in Davos. This groundbreaking technology is valued for its potential to revolutionize industries, enhance transparency, and improve accountability, making it a favored choice for international development initiatives. The International Monetary Fund (IMF) has conveyed a positive perspective on cryptocurrencies, urging their thoughtful consideration. Simultaneously, the World Bank has highlighted blockchain's capabilities in their working papers and reports. In Malaysia, the Rohingya community has initiated a pilot project titled "Blockchain Digital Identity Project for Rohingya Refugees in Malaysia." However, the borderless nature of blockchain raises concerns for nation-states concerning jurisdiction and sovereignty. These concerns are increasingly addressed in academic discussions, especially regarding cybercrime and digital offenses that may arise in one nation but adversely affect another. In late 2015, the Estonian government launched its e-Residency program, leveraging blockchain technology. This initiative enables individuals with internet access to acquire digital citizenship in Estonia, provided they meet specific security requirements and undergo background checks. The main aim is to simplify starting a business in Estonia, an EU member state, making it attractive for foreign entities looking to enter the trade zone. Moreover, the managing director of the Estonian e-Residency program announced the imminent development of a national cryptocurrency named "estcoin." This cryptocurrency aims to encourage global applications for e-residency, thus fostering the expansion of this emerging digital nation. The technology functions on a peer-to-peer network where each node retains a copy of the blockchain ledger. This distribution of control and data across the network diminishes its vulnerability to censorship, manipulation, and attacks, preventing the targeting of a single control point. The blockchain network's resilience and security are further bolstered through decentralization.

Additionally, decentralized refugee data management promotes democratic governance. The academic community has seen increased interest in utilizing decentralized blockchain networks for various goals, as noted in a study by Zyskind et al. (2015). The application systems vary according to different types of blockchain infrastructure, including decentralized, centralized, and partially

decentralized. Most scholarly research favors a centralized model over decentralized methods in humanitarian assistance due to the paramount importance of protecting refugee data and privacy. Often, these networks are managed through community-driven processes that encourage democratic decision-making regarding protocol updates, consensus rules, and governance. The researcher highlights that this all-encompassing system allows network users to create and manage the blockchain protocol. Ismail Materwala (2019), suggests a blockchain platform that enhances resource sharing, trust, and security as an effective solution to the difficulties refugees and other stakeholders encounter in the management process. This platform's design promotes efficient and open distribution of resources to all participants in refugee management, ensuring fair resource allocation and minimizing effort duplication. Blockchain technology's decentralized and secure characteristics build trust among participants while protecting sensitive data by encrypting and storing it within the platform. This safeguard protects the privacy and confidentiality of refugees' personal details (Beduschi, 2019). This innovative method streamlines refugee management and enhances their wellbeing by providing timely and fair access to essential resources. Establishing a blockchain platform for aid distribution during a refugee crisis can be a practical and effective solution. Non-governmental organizations, government bodies, and humanitarian organizations can directly contribute to the blockchain, facilitating data sharing without a central coordinating body (Schneider, 2019).

This innovative approach can reduce corruption and lower administrative expenses linked to providing essential resources like food, medicine, and shelter to refugees. By utilizing smart contracts and decentralized verification, the platform guarantees a fair and efficient distribution of resources, minimizes redundant efforts, and ensures all needs are fulfilled. A prominent example of blockchain's role in resource allocation is the World Food Program's Building Blocks project, which enhances trust and security. Although potential challenges exist, such as limited technology access and privacy concerns, blockchain can be a powerful asset for managing refugee situations when implemented effectively. It streamlines resource sharing, strengthens security and trust through cryptography, and promotes self-determination and empowerment. While costs and vulnerabilities are associated with implementing and maintaining the system, the benefits significantly outweigh these issues. It's crucial to learn from the failures of earlier digital identity initiatives, like the Adhar Forum, which had noble beginnings but ultimately marginalized refugees, as indicated by Peña Gangadharan and Niklas (2019). The blockchain platform presents a comprehensive solution to refugee management challenges, positioning itself as a forward-thinking method for the future. This solution centers around a blockchain platform for managing refugee affairs, providing a decentralized and transparent system for processing refugee-related data and tasks, including demographic details, relief distribution, and administrative operations. Blockchain technology guarantees data integrity, permanence, and protection against unauthorized changes, improving the system's dependability and credibility. The UNHCR states that the refugee crisis remains a pressing global issue, with millions forced to flee their homes due to war, persecution, and other factors. As the number of refugees continues to rise, countries must collaborate to deliver assistance and support to those in need. The UNHCR is committed to advocating for refugee rights and ensuring they gain access to the necessary protections and resources for rebuilding their lives. Moreover, many refugees come from underdeveloped countries that lack the essential resources or infrastructure to properly support them, leading to overcrowded camps and poor living conditions. Additionally, some nations might impose strict immigration rules that hinder refugees' ability to seek asylum, leaving them vulnerable and without adequate protections.

Many nations still lack reliable civil registration systems, making verifying the authenticity of refugees' identification documents challenging. While it's true that many refugees come from underdeveloped countries, it's essential to recognize that some individuals may exploit these unreliable systems to present false identities. In response, stringent immigration policies are often enacted to safeguard national security and deter potential risks. Therefore, it's essential to examine the barriers and root causes of issues related to refugee management. There is a clear need for efficient management and distribution of aid, as well as a streamlined bureaucratic process between donors and humanitarian organizations. Establishing refugees' identities is a vital and complex task. Often, refugees arrive without identification because they may have had to abandon these documents to escape persecution. Additionally, individuals fleeing war or natural disasters frequently struggle to authenticate their identities. Children are particularly vulnerable; UNICEF reports that around 230 million children under 5 years old worldwide are unregistered.

Valid IDs alone do not ensure the safety and security of refugees, as fraudulent claimants may destroy their identities to hide their nationality, birthplace, or age. Non-Western languages often use writing systems distinct from the Latin alphabet, necessitating transliteration. However, this practice is not widespread, and names like 'Muhammad' can be transliterated in several ways, from Arabic to the Latin alphabet, which creates confusion and varying formats in different documents. To mitigate these inconsistencies, ICAO Doc 9303, Part 3, provides charts for Cyrillic and Arabic transliterations, serving as a reliable reference for documenting names and other key details in travel papers. At the same time, blockchain technology helps ensure accurate transliteration. Recent European studies have noted the advantages of employing biometric identifiers for refugees. Integrating biometric data into refugee management emerged in the late 1990s, primarily at border checkpoints to verify entry and exit records and manage watch lists.

Furthermore, biometric information is now utilized to issue identification cards for undocumented refugees and those with questionable original IDs. The UK and Dutch governments led the way by establishing a centralized biometric database to oversee asylum applications, returnees, and reintegration programs. Managing refugees and asylum seekers in Europe brings unique challenges due to the vast area of free movement, which requires adequate political and administrative coordination. The EU data system has led to an "asylum shopping" phenomenon where individuals denied asylum in one country hope for a more favorable outcome elsewhere in the EU. In response, the

European Union introduced the EURODAC technology system in December 2000, formally launched in January 2003 under Brouwer and Evelien. This system is designed to help monitor and identify asylum seekers and irregular migrants entering the European Union, thereby enhancing immigration and border control management. EURODAC securely stores fingerprints and other biometric data to prevent individuals from applying for asylum in multiple countries.

Additionally, the system facilitates the swift return of individuals ineligible for asylum to their home countries. "Enhanced global refugee management may be realizable through this experience. This should assist in addressing the concerns highlighted in Chapter 5, titled 'Eurodac and VIS: Additional EU Databases Employed in the Domain of Immigration Control,' from the book 'Digital Borders and Real Rights', pages 117–144." Recently, amendments have been made to the EURODAC Regulation, allowing law enforcement officials access to the fingerprint database, which was previously restricted to asylum applications. This development permits law enforcement agencies to utilize EURODAC to effectively identify and prosecute individuals suspected of serious crimes or terrorism while ensuring strict adherence to the European Union's general data privacy laws. Upon arriving in Europe, all migrants are officially registered and must provide their fingerprints for movement control. However, this expansion of access raises concerns regarding the potential misuse of the database for broader surveillance or profiling based on nationality or race.

Additionally, asylum seekers might hesitate to give their fingerprints due to concerns about legal repercussions. While this process is manageable in EU Member States, it presents significant obstacles for refugees in the Global South or in developing countries hosting them. Although EURODAC serves as a fingerprint registration system for asylum seekers aiming to enter the European Union, it has its limitations. Its fingerprinting capabilities were once restricted to a specific category of applicants, mainly those arriving by boat. Catherine Odorige noted in "A Resolution in EURODAC for the Shoppers: Venue Shopping and Asylum Shopping" (12 July 2018), presented at Central and Eastern European eDem and eGov Days 331, the precise operational mechanisms of the EU's refugee border management system. A review of the literature earlier in this paper has indicated varied perspectives among scholars, policymakers, and international human rights advocates on decentralized blockchain technology. The ongoing discussion concerns whether decentralization enhances individual privacy and security or enables unregulated illegal activities within decentralized networks. Furthermore, the impact of blockchain technology, particularly concerning the energy consumption linked to mining operations, remains a significant topic of conversation. Despite diverse opinions, it is evident that thoroughly understanding the effects of decentralized blockchain technology requires ongoing collaboration and research from all parties involved. The 1951 Convention explicitly forbids denying entry based on an individual's refusal to provide fingerprints. Collecting and forwarding biometric data to the EURODAC Central Unit within 72 h can pose substantial challenges, as delays may enable asylum seekers to bypass the verification processes. In 2015, about 1.3 million people entered the European Union without valid visas, with 980,000 of them seeking asylum. To tackle this issue, EU officials suggested establishing biometric hotspots for swift identification, registration, and fingerprinting of migrants to prevent delays that asylum seekers might exploit.

Concerning data protection, the General Data Protection Regulation (GDPR) includes various measures to safeguard data, such as standard clauses issued by the Commission or supervisory authority and provisions in contracts between data controllers or processors and authorized recipients. Furthermore, the binding corporate rules under the GDPR become effective once all relevant members sign them. If a member without an EU establishment breaches these rules, the controller or processor in the EU member state bears the responsibility, as outlined in Article 46(2)(b). Corporations must establish specific reporting procedures to comply with the GDPR, as failure to do so may result in significant fines—up to 4% of their global annual revenue or 20 million euros, whichever is higher. Violations, such as failing to secure customer consent for data processing or violating fundamental privacy by design principles, can lead to penalties as per Article 46(1)(a). While a blockchain-based platform for refugee management presents potential advantages, it may not be feasible for all refugees, especially those in isolated or technology-illiterate regions, which could hinder inclusivity and diminish the effectiveness of resource sharing (Dahlberg et al., 2012).

This platform can potentially enhance resource-sharing efficiency among humanitarian organizations aiding refugees (Fechter and Schwittay, 2019). Utilizing blockchain technology can coordinate and distribute vital resources—such as food, shelter, medical assistance, and educational supplies—through smart contracts. This ensures transparent allocation based on set criteria (Cong and He, 2019). Ultimately, this fosters greater collaboration among organizations while maximizing resource utilization, resulting in more effective aid for refugees. Cryptographic techniques secure all transactions and data on the blockchain, maintaining trust and security within the platform, as they are tamper-proof and immutable (Singer and Bishop, 2020). The platform's accuracy, dependability, and verification processes assure various stakeholders, including refugees, humanitarian bodies, and governmental entities (Hailbronner, 1988). It also includes access controls and encryption measures to safeguard sensitive refugee information and uphold privacy rights. By leveraging blockchain technology, the proposed solution creates a robust framework that encourages resource-sharing transparency, efficiency, and security, enhancing refugee management. The platform simplifies processes and ensures accountable resource allocation and distribution, enabling effective collaboration between aid providers and displaced individuals. Researchers (Ajana, 2012; Muzafarkamal and Hossain, 2019; Van Oers et al., 2018), emphasize the significant potential of blockchain technology to transform data management in refugee facilities through a decentralized and immutable ledger. This characteristic prevents data falsification and alteration, establishing a secure and reliable method for handling sensitive information. Unfortunately, corruption and data management challenges are prevalent in many refugee organizations. For example, in specific Ethiopian organizations,

employees solicit bribes to modify database records or issue unauthorized documents.

Nevertheless, blockchain technology can eradicate these corrupt practices, facilitating a fair and transparent system that preserves the integrity of sensitive refugee information while protecting their privacy. The transparency inherent in blockchain systems builds trust among all involved parties, as every action and transaction are recorded and accessible to authorized users. This level of openness improves decision-making efficiency and promotes accountability among organizations involved in refugee management. However, it is essential to recognize that blockchain technology is not entirely foolproof. According most scholars viewpoints, it is susceptible to a 51% attack, where a coalition of miners could manipulate the blockchain data by controlling most of the network's mining power. Furthermore, the transparency of the blockchain could raise privacy and confidentiality concerns for refugees who may wish to keep their information private.

6 Key features of the solution

Integrating blockchain technology into refugee assistance represents a multifaceted endeavor that necessitates meticulous planning and execution, informed by comprehensive scientific inquiry (Ghorashi, 2005; Jahre et al., 2018). The benefits of employing blockchain in the management of refugee affairs are substantial for both the individuals affected and the humanitarian organizations involved. Current refugee management systems entail considerable costs and are vulnerable to corruption. Consequently, international organizations are compelled to leverage technology to enhance their support frameworks and coordination efforts. The decentralized and transparent attributes of blockchain guarantee that all transactions and aid distributions are both traceable and verifiable, thereby diminishing the potential for fraud and corruption (Prasse-Freeman, 2020).

Furthermore, this technology establishes a robust and tamper-resistant system for the storage and retrieval of critical refugee information, which, in turn, augments the efficiency of delivering targeted support (Jahre et al., 2018). Smart contracts facilitated by blockchain enable automated and secure monetary transfers, thereby eliminating intermediaries and reducing administrative costs. Moreover, with the implementation of blockchain technology, data is disseminated solely within the framework of a central authority, significantly mitigating the risk of data misuse, thus making it highly suitable for data management and privacy preservation. Considering its distributed ledger capabilities, smart contracts, and identity management functionalities, blockchain technology is exceptionally adept at enhancing refugee management, particularly through decentralized ledger blocks (Ismail Materwala, 2019). A decentralized ledger enables the monitoring of resource utilization and quantities effectively. Automated smart contracts adhere strictly to predefined rules and conditions, thus ensuring the clear and efficient distribution of resources (Cong and He, 2019). In the Philippines, the Bangko Sentral ng Pilipinas has officially acknowledged digital currencies such as Bitcoin under Circular No. 994 Series of 2017 (Kuo and Ohno-Machado, 2018). This circular pertains to virtual currency exchanges that either provide services or facilitate the conversion between fiat currency and virtual currency. Concurrently, the European Union adopts a mixed strategy, distinguishing between blockchain technology and cryptocurrencies. In 2017, the European Banking Authority cautioned the public regarding the risks associated with virtual currencies and provided recommendations to mitigate money laundering and terrorism activities.

7 Implementation challenges

A practical and sturdy technological framework is essential for successfully implementing a blockchain system aimed at refugee management. According to research by Brown et al. (2019), the success of such a system largely depends on adequate computing power and connectivity. However, organizations and governments may be reluctant to adopt this technology due to its complexities and potential disruptions to current systems. A significant hurdle in utilizing blockchain for refugee management is the lack of skilled professionals who can establish and maintain the blockchain infrastructure, as pointed out by Malik et al. (2022). When employing blockchain for storing refugees' personal documents, it is critical to carefully address privacy and security concerns. Although blockchain technology offers a secure and decentralized means of information storage, personal documents stored on a public blockchain, such as Ethereum, are accessible to everyone, which poses risks to individual privacy and increases the likelihood of identity theft or other forms of exploitation.

Public information on such blockchains may also breach data protection laws and privacy regulations, especially concerning sensitive information like medical records. Adjusting data protection regulations across various jurisdictions is essential for the public storage of such data. Some experts propose using a private blockchain for personal information to limit access to authorized users. However, this still poses risks of insider attacks or compromised nodes that could reveal the private blockchain. Implementing robust measures such as encryption and access controls is paramount to mitigate security challenges. Regularly monitoring and auditing each refugee engaging with the digital identity system is also crucial to identify potential security vulnerabilities. While blockchain technology presents promising opportunities for refugees to store personal documents, carefully considering privacy and security is necessary to protect sensitive information. Strong security protocols are vital for data protection and preventing unauthorized access. Through blockchain-enabled digital identity solutions, organizations can gain insights into resource distribution and reduce costs. Digital identities serve as a dependable means of identification for refugees seeking access to assistance, welfare, remittances, donations, and healthcare. Blockchain technology lays a strong foundation for organized, evaluated, and utilized information, promoting transparency and traceability in recordkeeping, which helps deter identity fraud and data mismanagement.

Additionally, it holds the promise of streamlining operations, lowering costs, and enhancing efficiency across multiple sectors. Recent studies indicate that data privacy poses a significant challenge in utilizing blockchain technology for sensitive refugee data storage (Di Vaio et al., 2022). Since blockchain operates

as a decentralized and transparent technology, it is essential to implement stringent measures to safeguard personal data and thwart unauthorized access. Consequently, strong encryption methods and strict access controls are vital for protecting the privacy rights of refugees. Additionally, integrating new technologies like blockchain can face pushback and resistance from stakeholders, necessitating a thoughtful change management strategy. To navigate these issues, it is critical to systematically address challenges and adopt a thorough plan for successfully deploying a blockchain system in refugee management. Upholding human rights principles means safeguarding refugees' privacy must take precedence before rolling out blockchain-based solutions (Cheng, 2021). Adhering to data protection laws and enforcing strong security measures is essential. Integrating blockchain technology in humanitarian aid provides opportunities and challenges that demand careful evaluation, especially considering the pivotal role of infrastructure. For a successful blockchain approach to managing refugees, it is imperative to ensure a strong technological foundation that includes adequate storage capabilities, computational power, and network connectivity to accommodate the decentralized nature of blockchain networks.

The impacts on refugee donations and transparency linger, complicating solutions to the regional refugee crisis. Based on personal experiences and research of the Ethiopian refugee system, it has been noted that refugees often pay fees to hasten the issuance of their documents and face long queues during registration. Consequently, after escaping the camps, many seek to migrate to Europe via the Donjoures route. Concerns about the equitable distribution of aid intended for refugees have arisen, as it seems all employers involved can benefit from the situation. This unfortunate reality may necessitate fulfilling the objectives of the 2030 Agenda as initially intended. The number of refugees in the Global South is rising, highlighting the urgent need for improved protection measures and governance systems. A recent study revealed inadequate sanitation facilities for refugees in Bangladesh and surrounding areas. Access to the internet and electricity is particularly critical in resource-scarce or remote regions where humanitarian aid is often required. Increased infrastructure could negatively impact blockchain solutions' performance, dependability, and scalability. However, implementing a blockchain-based solution for refugee management could be more feasible and effective in camps with reliable electricity and internet connectivity, as they would already possess the necessary infrastructure to support such operations.

To effectively utilize blockchain technology in humanitarian aid, multilateral collaboration among local communities, humanitarian organizations, and government agencies is essential. Nevertheless, challenges may arise due to a lack of understanding of blockchain, fears surrounding disruption to established systems, or resistance to change. To overcome these obstacles, a change management strategy is critical, which involves engaging and informing stakeholders. Demonstrating the precise benefits and value of blockchain technology in enhancing accountability, transparency, and efficiency can aid in gaining acceptance of privacy policies. Protecting refugee data is paramount when integrating blockchain into humanitarian initiatives. Strong encryption protocols and access restrictions are essential for securely storing sensitive data and limiting access to authorized individuals only. Establishing clear policies and procedures for data sharing and management is critical to prevent breaches and misuse. Safeguarding refugees' privacy rights while promoting blockchain technology's adoption in humanitarian aid can be achieved by proactively addressing privacy concerns and putting robust data protection measures in place.

Consequently, reports from the Global South have revealed the urgent need for improvements in the current refugee management system. Blockchain technology's immutability and transparency pose challenges in maintaining data privacy and adhering to data protection regulations, such as the General Data Protection Regulation (GDPR). To tackle these challenges, it is vital to develop and implement privacy mechanisms like encryption, zero-knowledge proofs, and selective disclosure. Zero-knowledge proofs can validate authorization without revealing sensitive information, while encryption protects personal data. Selective disclosure mechanisms allow authorized entities to access specific data for monitoring or auditing purposes, ensuring compliance with data protection laws. Strict adherence to regulations and robust security protocols is critical to minimizing the risk of data breaches or privacy violations. The deployment of blockchain technology in humanitarian assistance needs a comprehensive strategy that accounts for technological, organizational, and regulatory factors. Yet, there may be instances where privacy-preserving mechanisms must be integrated into the blockchain. Collaboration among technology providers, humanitarian organizations, government authorities, and other stakeholders is essential for overcoming challenges and reaping the full benefits of blockchain. Despite the importance of collaboration, the potential for data breaches or privacy violations due to insider threats or human error remains a constant concern.

7.1 Use case: refugee management

Blockchain technology can significantly change how refugee camps are managed, greatly improving accountability, transparency, and efficiency. By utilizing blockchain, organizations can securely store and access vital information about refugees, such as medical records and identification documents, and facilitate aid delivery. This approach promotes fair and efficient resource allocation and enhances collaboration among various agencies. Furthermore, the unchangeable nature of blockchain records discourages unethical behavior and fraud within refugee camps, thereby improving conditions for those affected. Integrating blockchain technology across different aspects of camp operations can automate processes like identification verification and registration, leading to smoother procedures and reduced administrative workload. For example, a refugee camp in a developing country could use blockchain to establish a secure database containing information about all residents, allowing for effective aid distribution based on verified identities and individual needs. This system removes the reliance on physical documents, which are prone to loss or alteration, ensuring that resources reach those requiring them. Currently, the way refugee management is implemented is inadequate, as the exploitation of refugees and other aid recipients leads to achieving less than half of the desired outcomes. This insight comes from the author's

firsthand experience setting up refugee camps and participating in various humanitarian efforts. Consequently, the need for manual records is eliminated since each refugee can be assigned a unique digital identity on the blockchain encompassing verified biometric data, personal information, and refugee status. The indelible nature of blockchain safeguards the confidentiality and integrity of administrative records, reducing the risk of unauthorized alterations or fraudulent actions. However, this method risks compromising the privacy and security of refugees, given that their personal data will reside in a publicly accessible ledger.

Furthermore, immigrants not well-versed in blockchain technology or lacking access to it may find it challenging to obtain and use their digital identities. However, blockchain offers an exciting opportunity to create a transparent and efficient method for resource allocation in refugee camps. Smart contracts, driven by established criteria and needs assessments, can automatically distribute necessary supplies such as food, shelter, medical care, and educational resources. Organizations aspire to utilize this technology to promote fair resource distribution, diminish inefficiencies, and improve operations. The primary objective is to create a more equitable and efficient system that benefits all individuals seeking assistance. Despite its apparent benefits in efficiency and transparency, there are concerns about potential biases or inaccuracies within the criteria established for resource allocation. It's essential to recognize that implementing this technology may result in unequal resource distribution or the exclusion of some needy individuals.

Additionally, refugee communities might lack the access or knowledge necessary to use digital platforms, which presents challenges regarding accessibility and trust. In response, the World Food Program and UNHCR have rolled out innovative refugee management strategies, incorporating smart contracts to enhance transparency and accountability in managing refugee camps. A pilot project by WFP in Jordan has showcased blockchain technology's capability to effectively monitor and verify resource distribution among stakeholders, ensuring that all refugees receive the essential aid they need. With the potential to transform refugee camp management, blockchain technology can benefit refugees and aid organizations. Nevertheless, grassroots advocacy has persisted worldwide for decades as an effort to overcome challenges and promote humanitarian aid. Early proponents highlighted the importance of NGOs maintaining their grassroots foundations and networks, which are crucial for their perceived legitimacy and resilience. Due to various challenges, many NGOs have shifted focus from their civil society missions to service delivery. While they have raised considerable funds for vulnerable communities, NGOs are increasingly detached from their original causes, leading to a prolonged crisis (Malik et al., 2022). As a result, many scholars, NGOs, and benefactors have revisited the legitimate merits that firm up their credibility. Constraints on external funding and strict domestic regulations restrict the transformative potential of NGOs. The Zapatista movement in Mexico and donors' varying objectives exemplify how requests for aid can disrupt NGOs' focus on grassroots initiatives. Numerous real-world examples illustrate how such challenges emerge in the global south, demonstrating the issues NGOs and philanthropic organizations face. In response to increasing support, the movement has advocated for greater engagement in program development and oversight, mainly concerning economic growth and gender issues (Burris and Anderson, 2010; Edwards, 2005). Considering donor pressures to align programs with their priorities, NGOs unable to secure additional funding sources have ceased operations in support.

Consequently, non-governmental organizations began functioning as development consultancies under external supervision. Geographic factors significantly influence the allocation of development funds. Research shows poverty or poor governance does not directly affect international non-governmental organizations (INGOs) (Kunapalan et al., 2020). The disparity between favored and neglected donors is exacerbated by the tendency of INGOs to cluster in donor-rich countries (Lepianka, 2007). The distribution of non-governmental organizations (NGOs) in Kenya and Mexico is primarily shaped by the availability of high-quality goods, beneficiaries, and donors, according to Brass (2011). While elite resources and funders can impact NGO placement in these countries, it is crucial to consider factors such as local needs, government regulations, and cultural nuances affecting NGO operations. Overemphasizing the influence of elites can oversimplify NGOs' intricate decision-making processes. The aid system seems indifferent to the practices, policies, and institutions perpetuating inequality and poverty. Under the principle of SDGs, Klasen and Fleurbaey (2018) have documented how this has led to the professionalization and depoliticization of development. The rise in professional expectations has resulted in adverse outcomes, such as independent NGOs being compelled to meet donor demands. Historically, participatory approaches have inadequately emphasized political elements, cultural awareness, community involvement, and foundational principles (Abu-Lughod, 2002). Again, Balboa argues that while international NGOs are skilled at fundraising and influencing policies, these strengths limit their ability to drive meaningful, substantial, and locally relevant change. Although strong local relationships are vital for effective operations, the immense global resources needed for significant success often overshadow (Acevedo-Garcia et al., 2004). In a worldwide NGO executing a water sanitation project in a rural area, focusing on fundraising and policy influence may lead to a poor understanding of local cultural customs and water source preferences. Insufficient interaction with local stakeholders can jeopardize the project's success and diminish community support. While global resources are crucial, establishing strong ties with local communities is essential to ensure culturally fitting and sustainable programs. Even well-funded initiatives can struggle to create lasting impact without genuine local involvement. Though grassroots and participatory development strategies have been recognized for years, their effectiveness has primarily been limited to service delivery improvements rather than enhancing collective action capabilities. In a rural Indian community, a grassroots initiative aimed to improve access to clean water through wells and pipelines. The effective use of blockchain technology can help save refugees, alleviate pressure on the refugee aid system, and foster fair resource distribution.

Moreover, the program offered comprehensive training on infrastructure upkeep and the promotion of hygiene practices. While these efforts enhanced the residents' overall quality of life,

they did not fully empower them to seek broader social and political change. Integrating blockchain technology into grassroots development efforts opens doors for delivering essential services and creating transparent, decentralized systems that promote fairer resource distribution while bolstering community resilience. This innovative strategy can redefine conventional foreign assistance models and provide enduring solutions for marginalized communities. Although it improved people's living standards, it did not address the underlying issues of poverty and social inequality that require collective action for resolution. Theories suggesting that resource management alone can eliminate poverty often overlook the institutional and systemic barriers that favor specific individuals over others. The application of blockchain technology could significantly transform refugee camp management. By establishing a digital identity for each refugee and securely maintaining personal information and aid distribution records on the blockchain, humanitarian organizations can guarantee accurate aid delivery to the designated recipients, reducing instances of fraud. This system provides numerous benefits in optimizing resource allocation and ensuring fair and prompt enforcement of camp regulations. Utilizing secure, tamper-proof blockchain technology increases the transparency and accountability of aid distribution systems, assuring that funds reach those they are meant for and enhancing resource distribution efficiency. Consequently, blockchain technology allows humanitarian organizations to offer more tailored support to displaced populations, benefiting refugees and host communities. The direct, peer-to-peer transactions between donors and beneficiaries also mitigate the risk of fraud and corruption. While adopting blockchain technology can improve transparency and accountability, it does not eliminate the risks of fraud or corruption in aid delivery.

Furthermore, adopting this technology may incur significant costs, making it unfeasible for certain groups needing support. Using blockchain technology for grassroots monitoring and tracking humanitarian deliveries has shown effectiveness. While grassroots-led and participatory development strategies have been acknowledged for many years, their success has mainly been limited to enhancing service delivery rather than fostering capacities for collective action (SUSTAINABLE REFUGEE RETURN: Triggers, constraints, and lessons on Addressing the development challenges of forced displacement Global Program on Forced Displacement, Cross Cutting Solutions Area on Fragility Conflict and Violence World Bank Group, 2015). This innovative approach greatly enhances clarity and accountability in aid distribution, ensuring that resources are allocated efficiently to those who need them most. Blockchain technology has optimized logistics in aid delivery by offering a dependable and immutable transaction ledger, thus reducing the risk of fraudulent activity and corruption. In his 2009 article by IOM "The Political Economy of Refugee Migration and Foreign Aid," (The Political Economy of Refugee Migration and Foreign Aid—IMI, n.d.) by Mathias Czaika presents evidence advocating for governmental and international collaboration to address the challenges faced by host communities, facilitating asylum cooperation through budget transfers. Czaika elaborates on the complexities of refugee migration and foreign aid, highlighting the necessity for effective and transparent distribution mechanisms. The transformative potential of blockchain technology in aid delivery and monitoring is considerable as it develops a more responsible and secure system for all stakeholders. Using blockchain, organizations can ensure that aid reaches the most vulnerable populations while minimizing the risks of mismanagement and misuse of resources. Despite blockchain's benefits for transparency and accountability, there are broader solutions to the challenges surrounding refugee migration and foreign aid. Issues such as political instability, corruption, and inadequate infrastructure can still hinder the effective delivery of assistance, regardless of the technology used. Therefore, humanitarian organizations can bolster their capacity to aid vulnerable communities and exert significant influence during crises. This enables the detection of inefficiencies or delays in the aid distribution process, facilitating swift remedies during emergencies. Adopting smart contracts to automate aid delivery verification can lessen administrative burdens while enhancing transparency, especially during natural disasters. Unique identification tags on aid packages promote efficient resource allocation, timely replenishment, and real-time monitoring of stock levels. Ultimately, blockchain technology simplifies various processes, fostering significant time efficiency, reducing errors in data management, and improving conditions for individuals residing in refugee camps. The decentralized aspect of blockchain encourages collaboration and coordination by providing a secure and easily accessible information storage method for all authorized organizations engaged in emergency responses. However, concerns linger regarding potential data modification or corruption within the blockchain. The system's decentralized nature minimizes the chances of unauthorized access, thereby lowering associated risks. Integrating resource-limited communities into the blockchain implementation process can help alleviate disparities in financial assistance distribution. Involving these communities in the design and decision-making phases ensures the technology is suited to their unique needs, helping them overcome any prevailing challenges. While decentralization reduces the risk posed by malicious actors, it does not wholly eradicate the threat of data corruption. Moreover, including resource-constrained groups in the design and decision-making processes ensures the technology effectively addresses their distinct requirements and challenges.

7.2 Partnerships and collaborations

To tackle complex societal issues, effective collaboration between the public and private sectors is essential. By bringing together technology providers, government bodies, and non-governmental organizations (NGOs), a range of resources and viewpoints can be leveraged to develop and implement practical solutions. Government agencies can utilize the capabilities and expertise of NGOs via strategic partnerships, ensuring initiatives align with legal standards and receive vital support. Likewise, by collaborating with technology providers, stakeholders can harness digital tools and innovations to improve service delivery and operational efficiency. Such collaborations are crucial for fostering a more sustainable and inclusive society. Government agencies play a fundamental role in creating policies that promote social progress. Successful social programs require

access to vital infrastructure and resources—such as healthcare facilities, funding, and transportation networks—which can be achieved through cooperation between government entities and NGOs.

Additionally, innovative service delivery models can arise from partnerships with technology companies. By utilizing the unique strengths of each sector and encouraging joint initiatives, societal challenges can be addressed more comprehensively and effectively. While recognizing the importance of a strong civil society, a narrow focus on NGOs and measurable outcomes from the donor community has limited its effectiveness in promoting genuine development. Civil society is essential for advocating and safeguarding the interests of marginalized or excluded groups. It provides a platform for individuals to collectively exert influence, negotiate, or engage with other stakeholders to reach their goals. Over the past 30 years, the global development framework has witnessed a fluctuating emphasis on the roles of the state, market, and civil society according to prevailing ideologies shaping the development agenda (Glynn, 2012). The aid sector's constrained view equates civil society with specialized NGOs, often engaging primarily in discussions that align with donor expectations and procedures. These typically involve strict accountability measures set by governments, Northern NGOs, philanthropists, and other non-traditional actors. Despite being seen as "democratizers of development" at the grassroots level (Van Oers et al., 2018), NGOs encounter significant challenges in enhancing civil society due to pressures to remain apolitical, fragile social cohesion, donor-driven accountability over beneficiary-focused accountability, and a preference for short-term goals at the cost of long-term structural development.

Integrating blockchain-based platforms within public-private partnerships is vital for building a sustainable and equitable society. The expertise and networks of NGOs make collaboration crucial for success. Moreover, engaging technology providers in the development and maintenance of these platforms is necessary to ensure their resilience and scalability. Working together, stakeholders can create innovative solutions to complex social issues. Managing refugee camps illustrates a multifaceted challenge that requires forming alliances and partnerships among various stakeholders. Government agencies can provide regulatory assistance and funding for creating and executing blockchain-based solutions to improve refugee camp management while benefiting from real-time data. Volunteer organizations specializing in humanitarian aid can share valuable insights regarding the specific needs and challenges in managing these camps. Additionally, employing blockchain technology enables these organizations to uphold the integrity of resource allocation and accountability in distribution. Technology firms can notably increase the operational efficiency of refugee camp management by facilitating data sharing and interoperability among different systems. Engaging government agencies during the rollout of blockchain solutions is crucial to securing access to necessary resources and ensuring compliance with regulations. By involving a wide range of stakeholders, a strong and sustainable blockchain infrastructure for managing refugee camps can be established.

7.2.1 Non-governmental organizations, states, and donners

Regarding community empowerment and grassroots movements, intermediary non-governmental organizations (NGOs) typically act as intermediaries connecting donors and local organizations, with a primary focus on fulfilling donor expectations. On the other hand, membership-based civil society organizations adopt a grassroots-oriented approach to development by directly engaging with the communities they support. The efforts of development NGOs aimed at promoting sustainable development and social change could improve significantly if they shifted their focus toward backing and endorsing membership-based organizations. Since the late 1990s, rapid globalization, the rise of market liberalization, and a noticeable increase in inequality have shaped the capacities and strategies of NGOs (Kunapalan et al., 2020). While it was expected that a reduction in aid would push NGOs to revert to their foundational principles, this outcome has not yet occurred (Hancock, 2001). Many NGOs need to demonstrate foresight, courage, and urgency to overcome their current limitations and evolve into agents of transformation rather than only providing temporary relief. To understand why development NGOs have made limited progress in achieving social change, it's essential to differentiate between membership-based civil society organizations and intermediary NGOs. Those looking to grasp the reasons for the limited societal impact of development NGOs must distinguish between these two types of organizations. Numerous researchers have highlighted the significance of donors, governments, NGOs, and Africa. This distinction remains critical, despite the challenges in defining diverse development NGOs. Moreover, while welfare states have dwindled, rising middle powers like South Africa, Turkey, and Indonesia are becoming increasingly prominent, alongside major private donors and philanthropists. Refugees in camps worldwide rely on NGOs for essential services and humanitarian aid. Their unwavering commitment ensures that the needs of vulnerable communities are met, and their rights are protected. From this angle, collaborating with NGOs to effectively deploy blockchain technology is essential. The associated study explores the migration hump theory, which suggests that the migration prospects of individuals with lower socioeconomic status are generally less favorable than those of their higher-status counterparts. Current discussions reveal that empirical evidence regarding the nonlinear relationship between economic development and emigration remains somewhat unclear In his 2009 article by IOM "The Political Economy of Refugee Migration and Foreign Aid," (The Political Economy of Refugee Migration and Foreign Aid—IMI, n.d.). Collaborating with NGOs allows organizations to improve the efficacy and scope of their humanitarian initiatives through technology integration. As volunteer organizations, NGOs play a vital role in developing and implementing blockchain solutions, capitalizing on their specialized expertise and practical understanding of the key issues and needs faced by refugees. Such partnerships could significantly improve the efficiency, transparency, and accountability of humanitarian aid delivery, fundamentally transforming how refugees around the globe access and receive assistance.

By working together, NGOs and other organizations can create a more effective and sustainable approach to the growing global refugee crisis. These entities bring vital skills, experience, and connections that facilitate the efficient use of blockchain systems tailored to the specific challenges refugee's encounter. Engaging with NGOs is particularly beneficial, as they have deep insights into the needs and difficulties faced by refugee populations. Despite their solid experience with these communities, NGOs can pinpoint the most urgent issues requiring action. They also foster community involvement, which is crucial for helping refugees adopt and effectively navigate blockchain systems. Recently, emerging powers such as Brazil, India, and China, along with middle powers like South Africa, Turkey, and Indonesia, have gained prominence, alongside influential philanthropic capitalists, private donors, and new actors within development. The weakening of welfare states is also noteworthy. Again, referring the study Kunapalan et al. (2020) suggest that such changes impact development paradigms. By closely examining the collaboration between states, donors, and NGOs, we can reassess whether these shifts enable NGOs to more effectively contest dominant corporate agendas and facilitate structural change. This report is grounded in a thorough review of existing literature on NGOs and their operational frameworks. Since this article's publication, the author has developed substantial expertise in refugee management. Over the past decade, their team of specialists has also acquired considerable knowledge and experience within the NGO field, including skills in teaching, research, and professional development. The author's earlier concerns remain relevant despite the increase in scholarly discussions about NGOs, civil society, and humanitarian assistance for refugees in recent years. From our viewpoint, many NGOs remain primarily focused on immediate relief while grappling with various internal and external challenges (Zanabazar et al., 2021).

Contrary to previous expectations that NGOs would return to their core missions as aid levels decrease, numerous organizations find themselves lacking the initiative, foresight, and courage to venture beyond their established roles. Nevertheless, it is critical to acknowledge that NGOs are just one part of the broader pursuit of social justice, transformative change, and empowerment. It is vital to differentiate NGOs from other civil society organizations, such as labor unions and social movements. Development policy influences these groups in multiple ways, as highlighted by academic critics (Klasen and Fleurbaey, 2018). Defining "development" for NGOs in a way that accurately encompasses their vast diversity is a challenging task. Additionally, distinguishing between membership-based civil society organizations and intermediary NGOs is key to understanding the limited progress that developed NGOs make in advancing social change, as discussed in this paper. NGOs are essential in delivering and managing blockchain systems, through user training, capacity building, and monitoring project outcomes. Organizations with extensive experience supporting refugees can create user-friendly, efficient, and effective systems that provide positive results for them. NGOs can also protect the security and privacy of refugee data stored in blockchain systems by implementing strong safeguards that ensure sensitive information is used ethically and responsibly. Moreover, NGOs can advocate for the adoption of blockchain technology with governments and international organizations, raise awareness of its benefits, and promote its integration within the humanitarian sector. Collaborating with NGOs can enhance these organizations' efforts to provide transparent and effective aid to refugees, improving their prospects and overall wellbeing.

7.2.2 Technology providers

Collaboration among humanitarian organizations, government agencies, and tech providers is essential for creating, launching, and maintaining blockchain platforms aimed at managing refugee camps. Tech providers bring their skills in blockchain development, software engineering, and cybersecurity. They can partner with both governmental and non-governmental organizations to develop blockchain solutions that tackle management issues within refugee camps, including identity verification, resource distribution, and aid logistics. Additionally, tech providers can offer continuous support and maintenance to guarantee the enduring reliability and efficiency of these blockchain platforms. By combining the strengths of humanitarian organizations, government bodies, and tech providers, stakeholders can leverage their resources to craft innovative, sustainable, and significant solutions that enhance humanitarian aid efforts and improve the lives of refugees. However, some critics argue that such collaborations may lead to conflicts of interest and slow down decision-making, potentially hindering the adoption of blockchain tools for refugee camp management. Therefore, it is vital to create clear guidelines and regulations to align all parties toward a unified goal: aiding vulnerable refugees. Through innovative tech solutions, transparent communication, and fostering a cooperative atmosphere, stakeholders can collectively aim to improve the welfare of refugees.

8 Success factors and impact

Integrating blockchain technology in refugee settings could radically improve how humanitarian organizations operate. This technology enhances aid distribution efficiency by offering a secure and transparent method for delivering resources to those in urgent need. Additionally, smart contracts help streamline processes and reduce corruption risks. Overall, using blockchain in these environments can boost accountability, promote trust, and positively influence the living conditions of displaced populations. NGOs must reassess their strategies, merging innovative technologies with traditional practices to tackle the systemic issues perpetuating poverty and inequality. Although blockchain offers a means to enhance accountability and trust, it does not address the root causes of such disparities that lead to continued displacement. Consequently, NGOs should focus on addressing these systemic challenges to drive meaningful change for displaced individuals. Development projects often aim for specific outcomes, requiring well-defined strategies to confront entrenched elites and corporate interests. Blockchain technology enhances the speed and transparency of aid delivery, providing a more secure framework for beneficiaries. Implementing a transparent and unchangeable transaction ledger minimizes the risk of corruption and fraud, enabling stakeholders to monitor resource movement along the supply chain. This monitoring is especially vital in refugee shelters, where verifying

identities is crucial for accessing necessary services. To maximize blockchain's potential, governments, international organizations, and technology companies must consider several key factors. For instance, within a refugee shelter, blockchain can securely store and verify personal information, ensuring that only eligible individuals receive support.

Moreover, organizations can leverage blockchain to track donations and allocations, actively preventing the mismanagement of resources intended for marginalized groups. Significant elements to consider include establishing a decentralized framework for accountability and transparency, using blockchain to mitigate data manipulation and fraud risks, enhancing efficiency in processes, and tracking resources effectively. The potential benefits of integrating blockchain technology into the humanitarian sector, especially for refugees and vulnerable communities worldwide, are extensive. Through meticulous planning and execution, this technology can provide advantages such as improved transparency, accountability, and security, leading to a more efficient distribution of aid to those in greatest need. While the benefits of blockchain concerning transparency and security are clear, it remains susceptible to tampering and fraudulent activities. Furthermore, introducing new technologies in humanitarian work may create challenges around accessibility and operational effectiveness for those in need of assistance.

8.1 Improved accountability

The adoption of an immutable blockchain ledger has greatly improved auditability in various systems. This technology enables thorough documentation of all transactions, creating a transparent and secure process for tracking data. By using blockchain, users can easily verify information's accuracy and ensure accountability among all participants. Ultimately, embracing blockchain technology has deeply impacted how information is organized and shared, enhancing trust and efficiency across multiple sectors. In aid distribution, this technology offers unmatched transparency, allowing for the traceability and verification of all operational actions. For example, during disaster relief, blockchain can ensure that donations reach intended beneficiaries by carefully tracking each transaction from donor to recipient. This increase in transparency decreases fraud and corruption, thereby building stronger trust in aid distribution. Blockchain records empower stakeholders to take accountability for their actions, reducing the risk of resource mismanagement or abuse. A key characteristic of blockchain is its ability to create an unchangeable and indisputable record of all transactions.

All changes to the ledger are carefully documented, securely encrypted, and distributed across multiple nodes within the network, making it extremely difficult for any party to alter the data. This heightened security and permanence guarantee that the aid distribution process remains fair and efficient, as every transaction can be easily traced and verified. Incorporating blockchain technology in aid distribution empowers organizations to enhance accountability and streamline processes, improving cost-effectiveness and dependability. In conclusion, using blockchain technology in aid distribution can significantly transform the operational methods of humanitarian organizations, ensuring that aid reaches the most vulnerable communities transparently and responsibly. Fairness and transparency in resource allocation foster trust among stakeholders. Since all transactions are clearly documented on the blockchain, auditors can readily confirm their legitimacy, greatly enhancing the audit process. The introduction of an immutable blockchain ledger in aid distribution notably elevates accountability by generating a transparent and traceable transaction record. This ultimately ensures responsibility among all parties involved and promotes an equitable and open distribution of assistance, thus lessening opportunities for mismanagement or resource misuse. Nevertheless, while blockchain technology shows potential for improving transparency and accountability in aid delivery, it does not resolve the root causes of resource waste or misuse, such as corruption or poor oversight. Additionally, blockchain technology does not automatically ensure fair distribution if fundamental systematic issues remain unaddressed.

8.2 Enhanced security

The widespread use of blockchain technology is rapidly rising due to its strong data protection capabilities. By employing advanced cryptographic algorithms within a decentralized structure, this data storage method is considered one of the most secure available. This paper focuses on examining a data management system specifically designed to maintain data availability and privacy, aiding the distribution of migrants. With blockchain technology, organizations can efficiently and securely handle sensitive information, such as refugee data, ensuring that it is accessible only to authorized personnel while protecting it from unauthorized access. This innovative approach to data management not only enhances security but also simplifies the distribution process for refugees, leading to more effective aid delivery. As awareness of blockchain's advantages grows, its potential to transform data security and management in humanitarian efforts is continually gaining traction. The intricate algorithms in blockchain produce a digital ledger that is highly resistant to tampering and fraud, making it a reliable method for handling sensitive financial data. The decentralized framework removes the need for a central authority to manage the data, thereby eliminating a single point of failure that significantly hampers malicious attempts to breach the system, thus safeguarding the wellbeing of refugees and humanitarian missions. However, despite the improved security and decentralization that blockchain offers, it still faces risks from software attacks and unauthorized data access.

Additionally, the complexities of blockchain can pose challenges for successful implementation and ongoing maintenance in fast-changing humanitarian environments. Embedding blockchain technology in refugee aid programs enables organizations to allocate resources efficiently and effectively to those in need. The fundamental immutability of blockchain ensures transparency and prevents alterations in transactions, promoting accountability and trust in the distribution process. A notable counterexample is the 2016 cyberattack on the Decentralized

Autonomous Organization (DAO) on the Ethereum blockchain, where $50 million in bitcoin was stolen due to a coding flaw. This event underscores that, despite enhanced security features, vulnerabilities persist that may lead to significant financial losses. Maintaining transparency and accountability at this level is essential for fostering integrity and trust in humanitarian actions, ultimately leading to greater positive impacts for refugees on a global scale. Given its promise of secure and transparent data management, blockchain is strategically poised to revolutionize how we store and share essential information.

8.3 Efficient resource management

Blockchain technology has profoundly changed resource management in refugee operations. However, in areas with limited technological access or unreliable internet, implementing blockchain can exclude some individuals from receiving vital resources. This creates a digital divide and worsens inequalities within marginalized communities. While blockchain empowers organizations to efficiently manage and distribute essential resources—like food, water, and medical supplies—to those in need, it's crucial for them to explore other ways to deliver support to individuals without access to the necessary technologies. Alternatives might include traditional aid distribution methods, such as physical distribution centers and community outreach programs. By combining blockchain technology with existing distribution strategies, organizations can ensure all individuals in need receive equitable access to resources, regardless of their technological situation. Blockchain has the potential to enhance both the efficiency and transparency of refugee assistance, while also addressing the digital divide faced by disadvantaged groups. Implementing these strategies can significantly improve how organizations manage refugee relief and facilitate effective aid delivery to those most in need. Blockchain allows organizations to track real-time resource distribution, improving coordination and aid allocation. This helps to reduce the risk of fraud and corruption, ensuring timely assistance reaches the intended beneficiaries. Adopting blockchain in refugee aid initiatives can enhance the effectiveness and accountability of support offered to displaced communities globally. Improvements in efficiency, transparency, and accountability have strengthened humanitarian aid operations, ensuring resources reach their intended recipients promptly.

However, the Rohingya refugee crisis in Bangladesh serves as a notable counterexample. While many organizations have incorporated blockchain technology in their operations, there have been documented cases of incompetence and malpractice in resource distribution. This highlights the urgent need for careful implementation and oversight of blockchain technology to unlock its potential benefits for accountability. Recently, a specific organization effectively used blockchain to create a transparent system, enabling donors to track their contributions and verify their proper use. Unfortunately, other organizations failed in their supervision of blockchain systems, leading to allegations of mismanagement and the improper allocation of critical resources. As a result, trust among contributors toward these organizations has waned. Successfully using technology to enhance accountability requires significant expertise and oversight. Poor management of blockchain systems has caused mistrust, underscoring the necessity for meticulous implementation of these technological solutions to ensure accountability.

Additionally, blockchain technology has facilitated the exchange of information among diverse groups and government entities, which aids refugees and allows for a more coordinated response to crises. A key strength of this technology is its ability to automate crucial functions such as aid distribution, identity verification, and data management. Smart contracts enable the automated distribution of resources based on preset criteria, thereby lowering administrative costs and ensuring that resources are directed to the highest priority areas. By maintaining the immutability, security, and accessibility of transaction records for all relevant parties, smart contracts improve transparency and accountability. The incorporation of blockchain technology enables organizations to enhance their resource management processes, minimize inefficiencies, and provide more effective support to those in need. Blockchain ensures thorough documentation of transactions that are accessible to authorized users, characterized by transparency and permanence. Despite improvements in transparency and accountability, the effectiveness of directing resources to critical areas may still be limited by potential corruption or inefficiencies in the distribution process. Furthermore, integrating smart contracts and blockchain may involve significant upfront costs and technical challenges for organizations looking to implement these systems.

8.4 Reliable identity verification

The potential of blockchain technology to significantly improve the lives of people in refugee and humanitarian situations is immense. This discussion presents the idea of blockchain data management and underscores the growing acceptance of its application. By utilizing blockchain technology, organizations can ensure secure and transparent transactions, streamline aid distribution, and create immutable records for refugees. This innovation has the power to transform humanitarian efforts, leading to greater efficiency and effectiveness in providing support to those in need. The immutable records from this system offer a trustworthy and unchangeable way to verify identities, granting each refugee a unique digital identity with verified information. Safe and selective information sharing allows refugees to access vital services, education, and job opportunities, promoting self-reliance and social integration.

Furthermore, blockchain technology encourages more transparent and efficient operations by maintaining an unalterable and visible log of all transactions and activities. This builds trust and accountability, enhancing the allocation and delivery of resources and ensuring that aid reaches those who need it most, thereby improving resource efficiency. Blockchain technology has proven its immense worth in humanitarian initiatives, empowering refugees. By establishing a verifiable and authenticated identity, refugees can gain access to essential services, education, and job opportunities, fostering their independence and integration into society. For example, a blockchain-based system could effectively

manage and authenticate the distribution of food and resources within a refugee camp, ensuring that help reaches the intended recipients while reducing the risk of corruption or mismanagement. Additionally, securely storing refugees' personal information on the blockchain allows for easy verification of their identity when seeking medical assistance or job applications, thereby improving their chances of integrating into a new community. While there may be challenges related to the accessibility and comprehension of blockchain technology among all refugees, the significant benefits of implementing it in refugee and humanitarian contexts are undeniable. These advantages include improved transparency, accountability, efficiency, better outcomes for refugees, and more effective humanitarian operations. Ultimately, the substantial benefits far outweigh any potential drawbacks, greatly enhancing the successful integration of refugees into society.

9 Future opportunities and scalability

The potential of blockchain technology to transform humanitarian relief and refugee management is highly significant. One key advantage of blockchain is its scalability; when a solution is successfully implemented in one location, it can easily extend to others. Establishing a cohesive and interoperable network for resource sharing among governments, humanitarian agencies, and other stakeholders could greatly assist in addressing global refugee management challenges. Another significant benefit is blockchain's seamless integration with existing systems. By incorporating blockchain solutions into government frameworks and humanitarian operations, a more efficient network for managing and distributing aid to refugees can be achieved. This integration enhances transparency, accountability, and secure data sharing, thereby improving the effectiveness of global refugee initiatives. The diverse applications of blockchain in humanitarian settings highlight its potential to fundamentally transform global refugee management. Continued advancements in blockchain technology are anticipated to accelerate its adoption in humanitarian aid, making a considerable impact on global refugee crises. It offers a practical approach to the complex issues surrounding refugee administration, enabling organizations to convey successful strategies and insights across various regions. The scalable nature of blockchain facilitates easy integration with established systems, supporting its implementation across different sectors.

Moreover, a blockchain-based framework can enhance transparency and accountability, ensuring that aid and resources reach their intended recipients. By connecting regions through a standardized blockchain network, improved data sharing and communication among humanitarian participants become possible, fostering better coordination and collaboration. Incorporating blockchain solutions in global refugee management can significantly enhance the effectiveness and sustainability of initiatives designed to support displaced individuals worldwide. A prime example is utilizing blockchain technology in refugee camps to oversee the distribution of food and supplies. A permanent, transparent record in the blockchain would track every transaction, from resource procurement to distribution among families. Ensuring equitable and efficient resource distribution is essential for minimizing risks of corruption and mismanagement. The implementation of blockchain technology can significantly improve the organization and effectiveness of humanitarian aid for displaced populations. Data-sharing networks offer immediate access to information, allowing for seamless integration with existing systems and enhancing data management processes. Blockchain establishes a secure, transparent framework for monitoring aid distribution, ensuring optimal resource allocation.

Furthermore, this system can integrate effortlessly with advanced technologies like artificial intelligence and machine learning, improving decision-making and management strategies for refugees. However, challenges may arise when incorporating blockchain into current systems. For example, government agencies might find it difficult to integrate blockchain into their existing infrastructures. While blockchain technologies promise enhanced efficiency and accuracy, their complexity and high integration costs can pose significant challenges. Issues such as data incompatibility, system accessibility, and the need for personnel training on new technologies may obstruct the anticipated integration benefits. Aligning with existing workflows and procedures is vital for promoting adoption and scalability across various organizations and regions. Additionally, the successful implementation and maintenance of blockchain systems may necessitate additional resources, including reliable internet access, technological infrastructure, and electrical power, to ensure their practicality and effectiveness. These constraints could undermine the benefits of blockchain concerning efficient information exchange and resource distribution. Although blockchain technology offers considerable promise and scalability for humanitarian operations, challenges may surface in resource-limited environments due to concerns regarding data privacy, security, and infrastructure development. By integrating and expanding these systems into other areas, blockchain solutions can effectively address the complex challenges faced by humanitarian organizations and refugees, ultimately leading to improved outcomes for displaced populations worldwide.

10 Conclusion

This paper analyzes the benefits of using blockchain technology in managing refugees. Implementing blockchain can significantly improve the efficiency and security of refugee administration. Its decentralized nature allows for transparent and immutable records, enabling adequate identity verification and tracking of refugee movements. Additionally, blockchain can optimize the distribution of aid and resources, enhancing transparency and accountability. By integrating blockchain into refugee management systems, we can significantly enhance the wellbeing of displaced persons while increasing the effectiveness of humanitarian efforts. Although the significance of identity management is widely recognized, current studies only scratch the surface of blockchain's potential in this field. This paper introduces a theoretical framework designed to promote this technology, even though its implementation is still in the early stages. Literature reviews show that while the use of blockchain-based identity management is currently limited, it is crucial for progress in this sector. This framework aims to deepen our understanding of the benefits offered by this pioneering

technology. Identity management varies across industries, sectors, and nations, highlighting the need for more use cases to further advance the technology. The skills of IT professionals and software development firms must be leveraged to achieve this goal. A blockchain-based approach to refugee management provides a transparent system that simplifies resource allocation while empowering refugees. For instance, a software consulting company could create a blockchain-enabled identity management system for a non-profit working with refugees, ensuring safe and efficient aid distribution. Such technology would enable the tracking of personal data, medical histories, and food distribution, guaranteeing timely and clear resource delivery to those in need. This innovation has the potential to transform the methods employed by humanitarian organizations in tackling the intricate issues of refugee management. At its essence, the blockchain-based management solution enhances transparency, resource allocation, and refugee empowerment, reshaping our strategy toward this complex challenge. The study stresses the critical need for initiatives within Global South refugee communities to explore the advantages of blockchain technology. To build a more transparent, efficient, and inclusive refugee management system, we strongly advocate for collaboration among governments, NGOs, and technology providers in implementing and promoting this forward-thinking approach. Leveraging blockchain technology enables thorough documentation and easy access to all transactions and interactions within the system, effectively reducing corruption and ensuring accountability.

Boosting transparency will enhance trust among stakeholders, fostering more effective resource management and informed decision-making based on current information. By granting digital identities and data ownership to refugees, we promote a more inclusive and respectful framework, giving them agency and control over their belongings. It is essential that we collaborate to implement this innovative strategy, leading to a future where the needs of refugees are met with compassion and efficiency. One notable benefit of a blockchain-based refugee management system is its inherent transparency. Blockchain technology improves the auditability and clarity of operations and transactions, facilitating accountability and trust in aid distribution. However, while transparency is vital, there are serious concerns regarding the privacy and security implications of assigning digital identities and data ownership to refugees, as their sensitive information could be at risk of exploitation or misuse. Additionally, implementing such a complex system may demand significant resources and infrastructure, which might be more effectively used to meet the immediate needs of refugees. Moreover, digitizing refugee data and utilizing smart contracts increases efficiency by streamlining aid management and distribution, reducing bureaucratic obstacles and delays. As a result, assistance can be delivered more quickly and precisely to those in need.

Furthermore, blockchain technology offers a secure and unchangeable framework for storing and sharing refugee data, enhancing protections, and safeguarding sensitive information from fraudulent actions. Allowing refugees full ownership of their data and control of their digital identities empowers them to engage actively in decision-making and influence their management, fostering a sense of agency and self-determination. Automated resource allocation through smart contracts ensures timely aid delivery to those in need, minimizing waste and optimizing efficiency. For example, an advanced blockchain-based system can securely store and authenticate refugees' passports and legal documents, preventing identity theft and effectively protecting sensitive data. Aid organizations can distribute resources according to set criteria, such as family size or specific needs, ensuring effective assistance reaches those most require it. However, the costs involved in implementing and maintaining such a system may surpass its benefits, especially in environments with limited resources, and there may be specific vulnerabilities. In instances where internet access is unreliable or lacking within refugee camps, dependence on a blockchain system for document storage and distribution could impede rather than aid the assistance process.

Additionally, without ongoing updates and maintenance, the system might become vulnerable to cyberattacks, jeopardizing the security of refugee data. Implementing blockchain-based identity management systems aims to empower refugees, enhancing their dignity and autonomy. It is necessary for governments, NGOs, and technology providers to collaboratively engage in establishing and promoting this transformative method which can foster a more transparent, inclusive, and efficient framework for refugee management, addressing the needs of displaced populations globally. By leveraging the potential of blockchain technology, we can significantly improve the wellbeing of refugees and reinforce global humanitarian efforts. Nonetheless, it is crucial to recognize that while blockchain technology may provide benefits regarding data management and transparency, significant efforts are essential to confront the fundamental challenges refugees face regarding access to vital resources, legal support, and social integration. Understanding that tackling the complexities of the refugee experience necessitates more than just adopting blockchain technology is key. A holistic strategy that addresses all aspects of their integration and welfare is essential. While adopting blockchain technology could enhance data management and transparency, it is not a cure-all for the diverse issues refugees grapple with, such as securing necessary supplies and legal assistance. A comprehensive approach that includes all elements of integration and wellbeing is vital for effecting meaningful change in the lives of refugees.

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