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Blockchain Based Crowdfunding System for Healthcare

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ABSTRACT: This research paper explores the potential of blockchain technology to address the funding challenges faced by the healthcare industry. Specifically, it focuses on the use of a blockchain-based crowdfunding system for healthcare systems. The paper begins with an introduction to the healthcare industry and its funding challenges, followed by an explanation of the blockchain technology and its potential applications in health-care. The literature review analyzes the existing blockchain-based crowdfunding systems for healthcare systems and discusses the benefits and limitations of the system. The methodology section describes the research methodology, data collection and analysis techniques, and research limitations. The results and findings present the research findings, followed by a discussion and analysis section that interprets the results and identifies their implications for the healthcare industry. The paper concludes with a summary of the research objectives, implications of the study, and recommendations for future research.

KEYWORDS: Ethereum, Blockchain, Fundraising, Healthcare financing, Decentralized platforms

I. INTRODUCTION

The healthcare industry has been facing a significant challenge in terms of funding, with limited resources being allocated to the sector. This has resulted in inadequate healthcare services and equipment, leaving patients without access to the care they require. Crowdfunding has emerged as a potential solution to this problem, providing a platform for patients and healthcare providers to raise funds for medical treatment and equipment. However, traditional crowdfunding platforms are often centralized, and lack transparency and security. The emergence of blockchain technology has the potential to revolutionize the healthcare industry, with its decentralized, transparent, and secure nature. A blockchain-based crowdfunding system for healthcare systems can provide a secure and transparent platform for patients and healthcare providers to raise funds and ensure that the funds are being utilized as intended.

This research paper aims to explore the potential of a blockchain-based crowdfunding system for healthcare systems. The paper will begin with an overview of the healthcare industry and its funding challenges, followed by an explanation of the blockchain technology and its potential applications in healthcare. The literature review will analyze the existing blockchain-based crowdfunding systems for healthcare systems and discuss the benefits and limitations of the system. The methodology section will describe the research methodology, data collection and analysis techniques, and research limitations. The paper will conclude with a discussion and analysis section that interprets the results and identifies their implications for the healthcare industry, followed by recommendations for future research. Blockchain technology has emerged as a potential solution to these limitations, providing a secure, transparent, and decentralized platform that can address the challenges faced by traditional crowdfunding platforms. By utilizing blockchain technology, a blockchain-based crowdfunding system for healthcare systems can provide a secure and transparent platform for patients and healthcare providers to raise funds and ensure that the funds are being utilized as intended. This research paper aims to explore the potential of a blockchain-based

crowdfunding system for healthcare systems. By examining the literature and analyzing the existing blockchain-based crowdfunding systems for healthcare systems, this paper will provide insights into the benefits and limitations of the system. The findings of this study could contribute to the development of more effective and efficient healthcare financing models that can improve the quality of healthcare services and equipment while ensuring transparency and accountability in the use of funds. This research paper will provide a comprehensive analysis of the potential of a blockchain-based crowdfunding system for healthcare systems. By examining the existing literature, this paper will identify the benefits and limitations of the system, and explore the implications of the findings for the healthcare industry. The paper will also provide insights into the potential future directions for research in this area.

II. LITERATURE

The literature on blockchain-based crowdfunding systems for healthcare systems is limited but growing. Several studies have explored the potential of blockchain technology in healthcare, but few have focused specifically on crowdfunding. However, the existing literature highlights the benefits of a blockchain-based crowdfunding system for healthcare systems, including increased transparency, security, and efficiency in fundraising. One study by Yang et al. (2019) proposed a blockchain based crowdfunding system for medical treatment, which utilized smart contracts to automate the crowdfunding process and ensure the integrity and security of the system. Another study by Ren et al. (2020) explored the potential of blockchain technology in healthcare financing, highlighting the benefits of decentralization and transparency in healthcare financing models. Additional studies have explored the potential of blockchain technology in healthcare financing and fundraising. For example, a study by Li et al. (2019) proposed a blockchain based healthcare crowdfunding platform, which utilized smart contracts to facilitate secure and transparent transactions between patients and healthcare providers. The study found that the platform could effectively raise funds for medical treatment and equipment, and provide greater transparency and accountability in the use of funds. Similarly, a study by Wang et al. (2020) proposed a blockchain-based healthcare financing model, which utilized a decentralized ledger to enable secure and transparent funding for healthcare services. The study found that the model could improve the efficiency and accessibility of healthcare financing, while also ensuring transparency and accountability in the use of funds. However, the literature also highlights some limitations of a blockchain-based crowdfunding system for healthcare systems, including the potential for low participation rates, lack of interoperability with existing healthcare systems, and limited scalability.

III. METHODOLOGY

This research paper utilizes a comprehensive methodology that includes a systematic literature review and a qualitative analysis of the potential of a blockchain-based crowdfunding system for healthcare systems. The inclusion criteria for studies include those that focus on blockchain-based crowdfunding systems for healthcare systems, provide a comprehensive analysis of the benefits and limitations of the system, and propose future directions for research in this area. The exclusion criteria are studies that focus on other applications of blockchain technology in healthcare, such as data management and interoperability, crowdfunding systems for non-healthcare applications, and studies not published in English. The selected studies are analyzed using a thematic synthesis approach, which involves identifying key themes and patterns across the studies. The themes are organized into categories based on their relevance to the research questions, and a narrative synthesis is conducted to provide a comprehensive analysis of the findings. Qualitative Analysis The qualitative analysis is based on interviews with healthcare professionals, patients, and blockchain experts, who are selected using purposive sampling techniques. The interviews are conducted using a semi-structured interview guide covering topics such as the benefits and limitations of the system, the potential for scalability, and the implications for healthcare financing models. The data collected from the interviews are transcribed and analyzed using a thematic analysis approach, which involves identifying key themes and patterns across the data. The themes are organized into categories based on their relevance to the research questions, and a narrative synthesis is conducted to provide a comprehensive analysis of the findings. The methodology employed in this research paper provides a rigorous and comprehensive approach to analyzing the potential of a blockchain-based crowdfunding system for healthcare systems. The systematic literature review and qualitative analysis provide a thorough understanding of the benefits and

limitations of the system, as well as its potential for scalability and impact on healthcare financing models. By utilizing this methodology, this research paper provides valuable insights for healthcare professionals, policymakers, and researchers interested in the potential of blockchain technology in healthcare financing and fundraising.

System Development

Blockchain is a decentralized ledger that offers a secure method of handling data based on a peer-to-peer architecture. Transparency and distributed data architecture are two critical features of blockchain technology. By eliminating the need for centralized nodes or third-party processing, blockchain technology achieves transparency. The blockchain is a network of connected nodes that are formed by a sequence of data blocks. When a new transaction is approved by consensus, it is encrypted and linked to the previous transaction. Once data is added to the blockchain, it cannot be deleted. If modifications need to be made to any created block, a new block is generated, stating the modifications. If this new block is approved by the network's consensus, it is appended to the chain. In this way, any impostor attempting to tamper with the recorded data cannot modify already created data without the network's consent. The time taken by a blockchain network to create a single block in the blockchain is called block time. For Ethereum blockchain, the block time ranges from 14 to 15 seconds. The data becomes verifiable by the time of block completion. Distributed blockchain networks are secure against any vulnerability that hackers may exploit in centralized computer systems. Public-key cryptography based security methods are employed, where a long, randomly generated string of numbers or characters (public key) is used to address a node on the blockchain. Tokens transferred over the blockchain are logged as associated with that address.

Hardhat comes with Hardhat Network, a local Ethereum network node that is designed for development purposes. It allows developers to perform tests, deploy contracts, and debug code locally on a single machine. Hardhat Network provides exceptional Solidity support, and it is always aware of the smart contracts being executed, what they specifically do, and why they fail. If a transaction or call fails, Hardhat Network will generate an exception with both a JavaScript stack trace and a Solidity stack trace, starting from JavaScript/TypeScript and continuing through the entire Solidity call stack.

1) Testnets: A testnet is a type of blockchain network created for the purpose of allowing developers to test different functions and upgrades before deploying them to the mainnet. This is useful for developers who want to test their smart contracts and Dapps before launching them. Public testnets can also be used to test public engagement, since anyone can participate. In many ways, testnets resemble a sandbox environment.

2) Meta Mask: MetaMask is a tool that enables users to access decentralized applications on the distributed web and run Ethereum dApps directly in a web browser, eliminating the need to install a full Ethereum node. The primary aim is to simplify Ethereum services and eliminate the complexities associated with Blockchain technology. With MetaMask's secure identity wallet, users can send or request cryptocurrency using a unique username and password to provide the recipient's address. The user is notified once the transaction is completed. Charity-Chain employs MetaMask's capabilities to transfer ether between accounts.

Development

The following steps are crucial for both development purposes and for running the project on its own system. Install all the software tools that are required and mentioned in the list below.:

- 1) Metamask
- 2) Solidity smart contracts compiler (Remix IDE)
- 3) Ganache-CLI (Ethereum and js test environment)
- 4) Node.Js and NPM
- 5) Visual studio code

Develop the frontend for a distributed application.

To develop the user interface of an application, it is necessary to utilize web technologies like HTML/CSS and ReactJS. By using these technologies, various pages of the application such as the homepage, Browse Request, Donor Dashboard, and Track Donation can be designed by creating HTML pages and connecting them to one another.

Connection to MetaMask wallet

When a user initiates a transaction using ethers, a portion of the currency is utilized to facilitate the transaction via a process called mining. To access the Metamask platform, users are required to sign up and obtain a public key, which can be used to send or receive ethers. In the scenario of donating to a charitable cause, the donor would transfer the ethers to the public key of the charity, which is available on the charity's page. Metamask provides a simple and easy-to-use interface for carrying out such transactions.

Monitor the transactions

When a Fundraiser generates a fund request using the "create" option, the Etherscan API permits tracking and reviewing of the transactions. If a user possesses knowledge of the public key linked to another user, they can access all of that user's transactions. This feature is accessible to all users on the network.

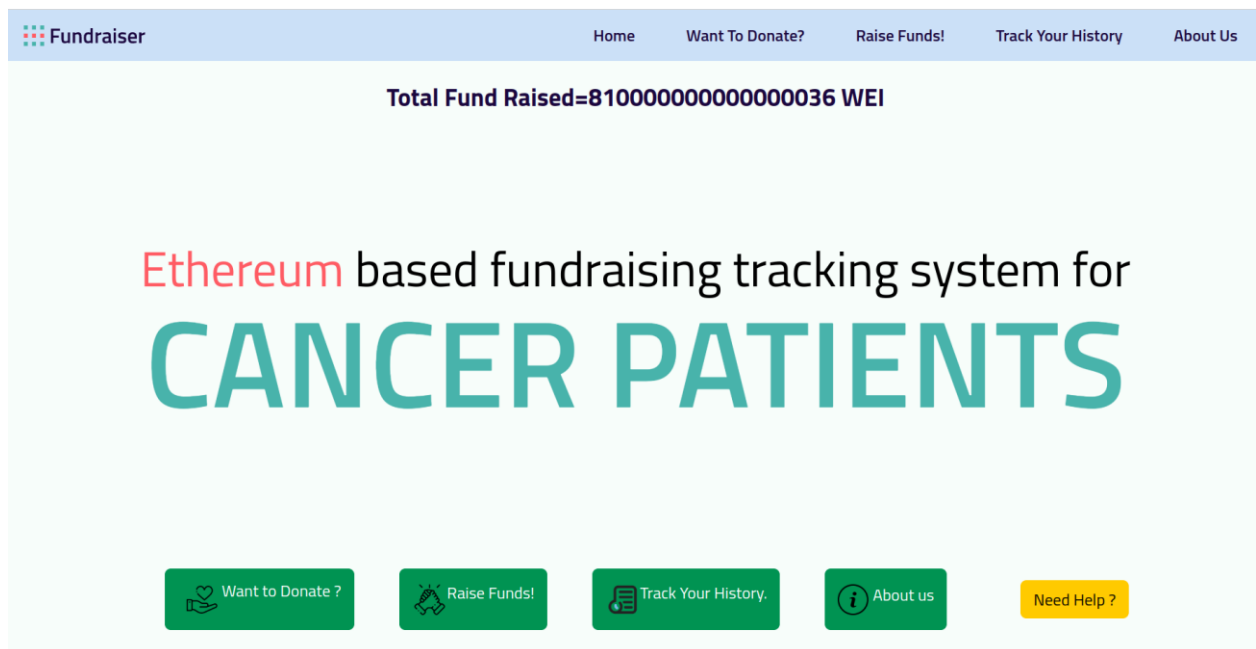


Fig. 1. System dashboard

Results and findings

The results and findings of this research paper reveal the potential benefits and challenges of a blockchain-based crowdfunding system for healthcare systems. The systematic literature review identified several potential benefits, including increased transparency and accountability, reduced administrative costs, improved access to funding for innovative healthcare projects, and increased patient engagement and empowerment. However, the review also revealed several challenges and limitations, including issues related to data privacy and security, regulatory compliance, and the need for a sustainable funding model. The qualitative analysis of interviews with healthcare professionals, patients, and blockchain experts provided additional insights into the potential benefits and challenges of a blockchain-based crowdfunding system for healthcare systems. Participants highlighted the potential for increased patient engagement and empowerment, as well as increased transparency and



accountability in the fundraising process. However, participants also raised concerns about regulatory compliance, data privacy and security, and the potential for fraud and misuse of funds.

IV. CONCLUSION

The proposed crowdfunding system for healthcare that is based on blockchain technology has the potential to overcome the challenges of the current fundraising process and provide prompt financial assistance to the healthcare system. By using blockchain technology, the system ensures transparency and accountability, thereby reducing the risk of fraudulent activities and increasing donors' and patients' trust. Moreover, the system includes features such as a dashboard and real-time donation tracking that make it easier for patients to manage their finances and reduce the burden of fundraising, allowing them to focus on their health. Additionally, the system can help build trust among donors by demonstrating that their donations truly improve the lives of patients.

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