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Research Article

Implementation of Blockchain Technology to Improving Transparency on Fundraising System

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Abstract: Various crowdfunding platforms offer numerous benefits, but transparency remains a major challenge within these systems. This issue has led to a decline in public trust, as donations are often misused or diverted from their original purpose. Blockchain technology, known for its transparency, offers a potential solution to this problem. This study aims to enhance transparency in crowdfunding systems by leveraging Blockchain technology. The implementation involves using tools and technologies to develop decentralized applications (DApps), such as thirdweb, Hardhat, and Metamask. In developing the DApp, data were collected through a literature review of theories and concepts related to Blockchain. Based on the gathered data, a Smart Contract was designed to serve as the structure for data management and functionalities for the crowdfunding system. Hardhat utilized a development tool to deploy the Smart Contract, while the thirdweb Software Development Kit (SDK) was employed to connect to the Blockchain. This study uses the Ethereum testnet to interact with and conduct transactions on the decentralized crowdfunding application. Metamask, a popular crypto wallet for DApps, was chosen as the exclusive wallet for the application due to its ease of use and widespread adoption. Analysis of the tests conducted shows that the application functions well under various operational scenarios, providing an intuitive and responsive interface while maintaining security. The results of this study demonstrate that the implementation of Blockchain technology in crowdfunding systems can significantly improve transparency, with immutable transaction records, public access to transaction histories, the use of Smart Contracts, and decentralized system operations.

Keywords: Crowdfunding, Blockchain, Transparency, DApp, Smart Contract.

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1. Introduction

Fundraising is often described as the process of obtaining funds and other resources such as material, informational, and human resources, that an organization cannot independently secure but are essential for executing a particular project or activity [1]. In recent years, crowdfunding has emerged as a popular alternative for MSMEs to secure funding and overcome the challenges of operating in the digital era. Today, the concept of crowdfunding is well-known among business professionals. It refers to a funding method where financial contributions are pooled from a group of individuals or organizations to support businesses, specific projects, personal needs, or other initiatives [2]. Crowdfunding platforms in Indonesia, such as Kitabisa.com, Ayobantu.com, and Rumahzakat.org, have provided significant benefits to the community, both by supporting social foundations and meeting urgent individual needs. However, despite the many benefits it offers, the main challenge in crowdfunding lies in the transparency of fund management. Cases of fraud and fund misuse, such as the Singgih Sahara case on Kitabisa.com, highlight that transparency is crucial to maintaining public trust [3].

In facing this challenge, Blockchain has the potential to enhance transparency and reduce misappropriation by providing automated and transparent transaction records, thereby minimizing data manipulation [4]. Blockchain is an innovative technology known for its security, high transparency, and immutable ledger, which makes it resistant to manipulation [5]. Blockchain is created by a peer-to-peer network, where each peer is a host running a Blockchain client or referred to as a node [6]. Blockchain is a distributed and decentralized digital ledger where every transaction or piece of data is recorded in "blocks" that are then linked together in a sequential "chain" [7]. In this way, Blockchain provides a transparent and verified system, thereby reducing the risk of misuse of funds and increasing donor trust in the crowdfunding platform [8].

The implementation of Blockchain on Crowdfunding platforms uses a smart contract system, codes and agreements are stored on a distributed and immutable public database running on the Blockchain [9]. Smart contracts allow the execution of certain functions without the need for the involvement of a third party or central authority [10]. In the context of crowdfunding, smart contracts ensure that the funds collected can only be used in accordance with the initial campaign goals, thus preventing the misuse of funds. Furthermore, Blockchain technology makes the entire process more efficient, from donation verification to fund distribution. With its transparent and trustworthy characteristics, Blockchain offers a relevant solution to address the weaknesses of conventional crowdfunding systems.

Blockchain-based applications, known as Decentralized Application (DApp), have demonstrated their effectiveness across various sectors, including fundraising. DApp operate in a decentralized manner, without relying on central servers or single authorities, offering a higher level of security and transparency compared to conventional applications. By leveraging distributed networks and smart contracts, DApp enable transparent and accountable fund management. This research aims to demonstrate cases where Blockchain has been successfully implemented in fundraising systems to enhance transparency while also identifying challenges and obstacles that may arise.

2. Proposed Method

2.1. Data Collection

Data collection is a crucial step in research to obtain relevant information aimed at achieving the established objectives [11]. In this study, the method employed is a literature review or library research. This method involves gathering data from various written sources, such as e-books, scientific journals, articles, and other references relevant to the research topic [12]. The literature review is conducted by reading, recording, and organizing information from available literature, both online and offline.

In addition, the author also complements data collection by conducting direct observations of several websites that have implemented Blockchain technology in their systems. This observation aims to gain practical insights into how Blockchain technology is implemented and to obtain empirical data supporting the research discussion. By combining the literature review and observations, it is expected that the collected data can provide a solid foundation for an in-depth analysis and discussion of the application of Blockchain technology in fundraising.

2.2. Data Design

A smart contract is used to automate the execution of an agreement or contract without the involvement of intermediaries or third parties. The code and the terms of the agreement are embedded within the contract, which is stored across the distributed and decentralized Blockchain network. This ensures that all transactions within the Blockchain network are traceable and immutable. The design of the data structure and functionality of the smart contract in this study can be seen in Table 1.

2.3. Rapid Application Development Method

This study employs the Rapid Application Development (RAD) method, which emphasizes rapid software development through four main stages. The first stage is system requirements planning, starting with identifying issues in the current fundraising system, conducting a literature review on Blockchain technology, and collecting data to formulate objectives and system requirements. The system design stage involves creating data structures, smart contract functionalities, system architecture, Unified Modeling Language (UML), and User Interfaces (UI), with iterative improvements made to meet the requirements.

In the development stage, the system is built using JavaScript for the frontend and Solidity for the backend, integrating technologies such as React.js, TailwindCSS, and Thirdweb. The final stage is implementation, where the system design is executed using Visual Studio Code and Figma, and the smart contract is deployed through Thirdweb with the assistance of Hardhat. System feasibility and functionality testing are conducted using the Blackbox testing method to ensure the system operates in alignment with its requirements and objectives.

Table 1. Smart Contract Design

Name	*Type*	*Description*
Program	struct	Structure that stores all fundraising program data
owner	address	Address of the account of the creator or owner of the fundraising program
recipient	address	Address of the recipient account for fundraising donations
title	string	Title of fundraising program
description	string	Description of the fundraising program
image	string	Fundraising program image banner
target	uint256	Program donation target
deadline	uint256	Program deadline
amountCollected	uint256	Total funds raised for the fundraising program
isFinish	bool	Fundraising program status
donations	Donation[]	List of donor funds that have distributed funds to the program
report	Report	Information containing reports on donation distribution
createdAt	uint256	Shows the time when the program was created.
Report	struct	Structure that stores program donation distribution reports
story	string	Stories from the donation distribution report
Donation	struct	Structure that stores all fundraising program donations
donator	address	Address of the donation sender account
amount	uint256	Amount donated
createProgram	Function	Create a fundraising program
donateToProgram	Function	Make a donation to a program
createReport	Function	Create a donation distribution report
getPrograms	Function	Displaying all campaign programs
getProgram	Function	Displays details of a program
getDonations	Function	Get all the donations of a program
getReport	Function	Displaying donation distribution reports

2.4. System Architecture Design

In this study, the system architecture is designed to assist the author in developing a fundraising system. This design also enables the author to determine the software, tools, and frameworks required for the development process.

To use the system developed by the author, users can access the fundraising Web App. Within the application, users can interact by making donation transactions or starting new fundraising programs. These processes are directly connected to the Blockchain network, requiring a crypto wallet to manage cryptocurrency on the Blockchain. One such software, Metamask, serves as a crypto wallet for managing users' cryptocurrency assets and also supports the author in developing and testing the application. The application interface is developed using TailwindCSS for styling and React.js to manage all user interface components.

In Figure 1, the system architecture design illustrates the software, tools, and frameworks used in development, as well as the workflow and how users interact with the system. The first stage begins with the developer writing a smart contract containing the necessary code to support the fundraising system on a Blockchain network. This smart contract is developed using Hardhat, a tool that facilitates deployment onto the Thirdweb platform. Once the smart contract is successfully deployed, Thirdweb enables direct interaction with the Blockchain network, allowing for transactions, block creation, and data retrieval from the Blockchain. Thirdweb also provides a Software Development Kit (SDK) that the author can use for further system development. An illustration of the system architecture design is shown in Figure 1.

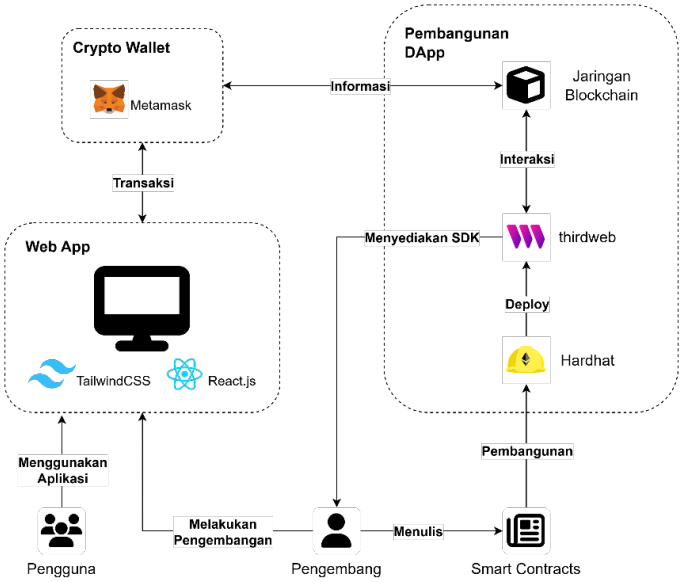


Figure 1. System Architecture Design

3. Results and Discussion

3.1. Data Application/Processing

Data processing in this study involves the development of a smart contract to support a decentralized, transparent, and secure fundraising system. The data is designed with a complex structure to track donations, reports, and fundraising programs based on the predefined requirements. By utilizing the "struct" and "mapping" features in the smart contract, the system can efficiently store, process, and display campaign data. This design ensures that every element, from donations to fund utilization reports, is accessible transparently and immutable, in line with the principles of Blockchain technology. Once the smart contract is completed, the code is deployed using the Thirdweb platform. A code guide for utilizing the Thirdweb SDK is illustrated in Figure 3.

Thirdweb simplifies the development of Blockchain-based applications by providing a Software Development Kit (SDK) for integrating and interacting with deployed smart contracts. Additionally, Thirdweb provides the smart contract's address along with guidelines for utilizing the SDK in application development.

3.2. Process Implementation

The implementation process in this study involves developing a Blockchain-based fundraising system using a smart contract deployed through Thirdweb. The smart contract ensures transparency and security in managing donations, where every transaction is permanently recorded on the Blockchain and can be verified by all parties. With the Thirdweb Software Development Kit (SDK), integrating Blockchain with the user interface becomes more straightforward, enabling an efficient, secure, and user-friendly fundraising system.

The system is developed using React.js as the primary library for building dynamic web applications, with TailwindCSS supporting modern interface design. To connect the application to the Blockchain, the Metamask crypto wallet is used as a bridge and storage for digital assets. The Thirdweb SDK is implemented through React Context, storing information such as the smart contract address, client ID, and the Ethereum Sepolia chain ID. The results show

that the system successfully connects to the Blockchain, with Metamask providing access notifications whenever interaction with the crypto wallet is required, creating a transparent and decentralized platform.

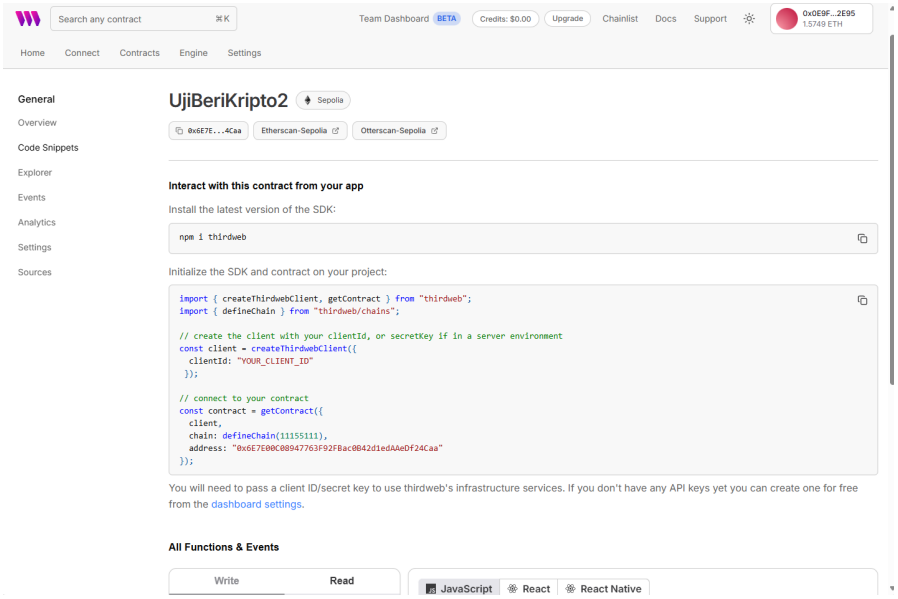


Figure 2. Code guide for using thirdweb SDK

3.3. Interface Implementation

This chapter presents the implementation of various User Interface (UI) designs that have been developed. Each design is created with a focus on simplicity and user-friendliness, allowing users to easily understand the application flow even without in-depth knowledge of Blockchain technology. The UI is built using React as the primary framework and Tailwind CSS to achieve a modern design. Additionally, integration with Metamask as a cryptocurrency wallet simplifies secure and transparent transactions for users. The explanation of each interface includes the functionality flow and visual elements that enhance the user experience, covering the main page, campaign creation forms, donation screens, and reporting views. The detailed descriptions of each interface are as follows:

3.3.1. Interface Implementation

The following is the detailed program page for crowdfunding that can be selected on the main page. The detailed program display is illustrated in Figure 3.

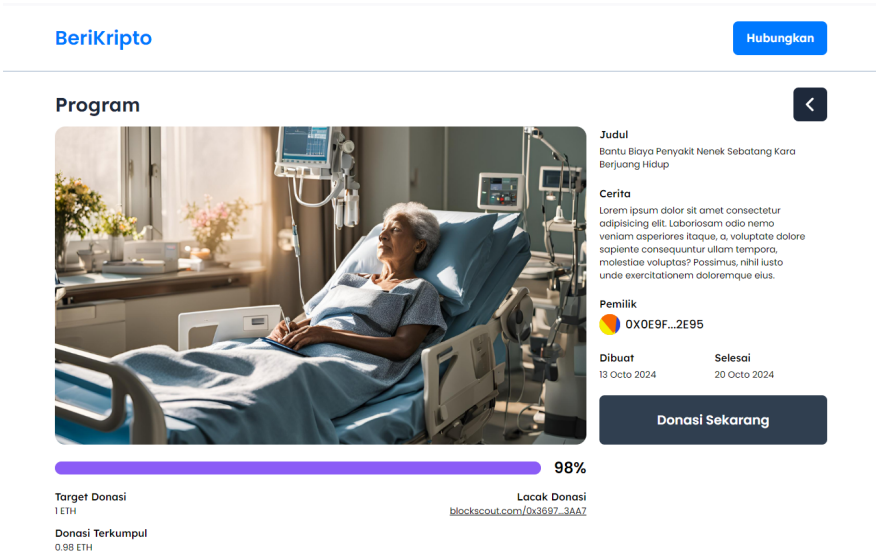


Figure 3. Detailed of Fundraising Program

3.3.2. Donation to Program

When Metamask is successfully connected to the application, users can access various features, including the donation feature. A modal or popup window appears when the user clicks the "Donate Now" button. This modal contains a form where users can enter the donation amount. An example of the application displaying the donation modal for a program is shown in Figure 4.

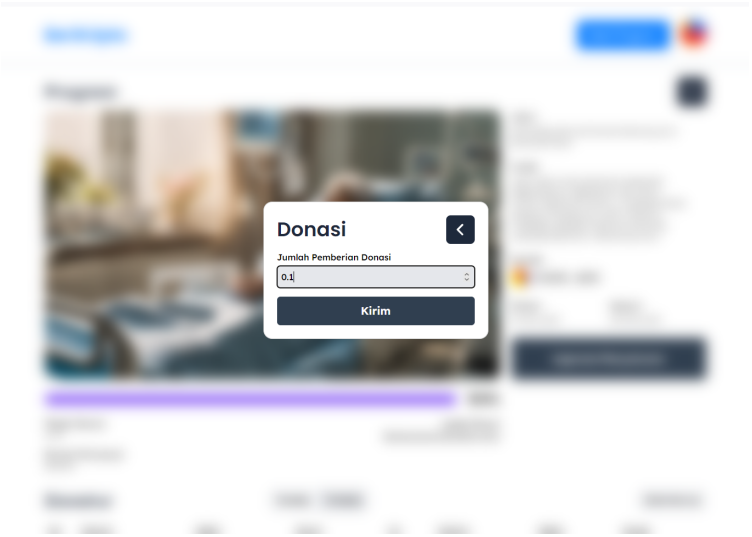


Figure 4. Donation Modal

When the "Send" button is clicked, the application forwards the transaction to the connected Metamask account. If the program creation is successful and com-pleted, the user's crowdfunding program will appear under the "My Programs" section on the main page. An example of a newly created crowdfunding program is shown in Figure 5.

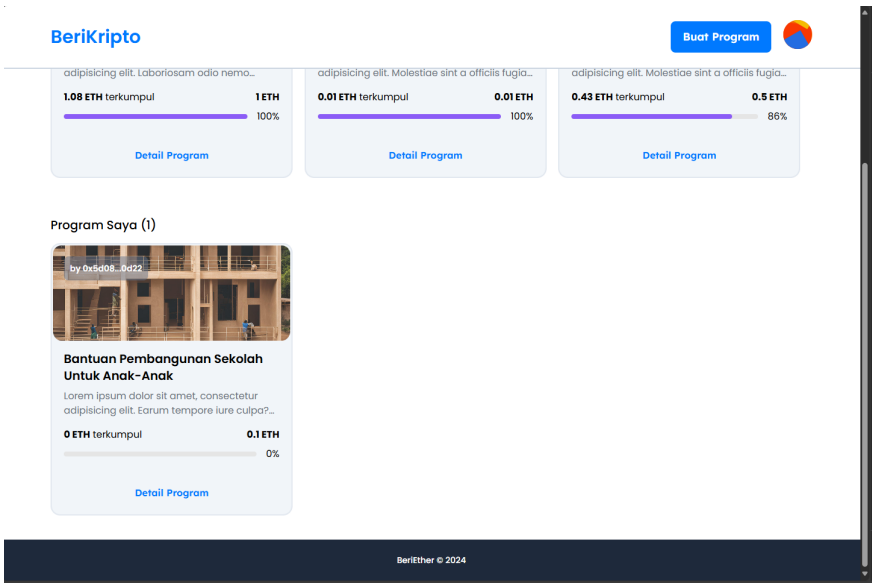


Figure 5. Home Page My Programs Section

3.4. Equations

This chapter discusses the testing results of the Blockchain-based crowdfunding application using the Blackbox testing method. This method focuses on testing system functionality without examining the source code or the internal structure of the application. The aim is to ensure that each feature operates according to the specified requirements and to evaluate how the application responds to various user inputs. The testing covers all key components, including creating crowdfunding programs, making donations, withdrawing donations, and

integrating with Metamask for transactions. Additionally, interactions with smart contracts and the user interface are tested to ensure ease of use and an intuitive user experience. The results of these tests provide an assessment of the application's functional success in various operational scenarios. Based on the test design outlined in this study, the following are the testing outcomes using the Blackbox testing method:

- User Interface Testing.

Table 2. Blackbox User Interface Testing Results

No	*Test Scenario*	*Expected results*	*Test Results*
1.	Home page, open the application	The application can display all fundraising programs.	Success
2.	Program details page, select the "Program Details" button on one of the programs on the main page.	The application can display detailed information about the fundraising program.	Success
3.	Modal donation for the program, select the "Donate Now" button on the program details page	The application can display the donation form for the fundraising program.	Success
4.	Modal donor program, select the "All Donors" button on the program details page	The application can display a list of all donors of the fundraising program.	Success
5.	Connected navbar, crypto wallet connected to the app	The app can change the appearance of the navbar.	Success
6.	Create a fundraising program page, select the "Create Program" button on the navbar	The application can display the form page for creating a fundraising program.	Success
7.	The main page lists the user's programs, open the main page and scroll to the bottom of the page	The application can display a list of all the user's programs.	Success
8.	The main button for the user's program details, selecting the "Program Detail" button on one of the user's programs	The application can display the "Withdraw Donation" button when the user's fundraising program.	Success
9.	The main button for program details that have passed the deadline, select the "Program Details" button on one of the fundraising programs	The application can display the "Distribution Report" button when the fundraising program has passed the specified deadline.	Success
10.	Modal distribution report, select the "Distribution Report" button on the fundraising program details page	The application can display the capital distribution report of donations.	Success

- System Function Testing.

Table 3. Blackbox Test Results of System Functions

No	Test Scenario	Expected results	Test Results
1.	Selecting the "Hubungkan" button on the navbar	The app can perform the process of connecting to the user's crypto wallet.	Success
2.	Selecting the sort order button on the list navigation of all donors on the fundraising program details page	The application can sort the list of program donors based on the sort order button selected.	Success
3.	Selecting the "Kirim" button on the program donation modal on the fundraising program details page	The application can make donation transactions for the fundraising program with the user's crypto wallet.	Success
4.	Selecting the "Choose File" button on the form page creates a fundraising program	The application can select image files on the device used by the user.	Success
5.	Selecting the "Buat Program" button on the form page creates a fundraising program	The application can create a new fundraising program with the crypto wallet used by the user.	Success
6.	Selecting the "Tarik Donasi" button on one of the user's programs	The application can make program donation withdrawal transactions with the crypto wallet used by the user.	Success
7.	Selecting the "Choose File" button on the program donation distribution report creation form modal	The application can select image files on the device used by the user.	Success
8.	Select the "Buat" button on the program donation distribution report creation form modal	The application can create a program donation distribution report with the crypto wallet used by the user.	Success

- Validation Testing.

Table 4. Blackbox Validation Test Results

No	Test Scenario	Expected results	Test Results
1.	Validate the donation amount	The application may give a failure message if the amount entered is a negative number.	Success
2.	Image file validation	The application may give a failure message if the selected file is not an image format.	Success
3.	Deadline validation	The application may give a failure message if the time given is less than the creation time.	Success
4.	Validate program donation target	The application may give a failure message if the amount entered is a negative number.	
5.	Donation withdrawal validation	The application may not provide the "Tarik Donasi" button if the donation	Success

No	Test Scenario	Expected results	Test Results
		withdrawal is made before the deadline.	
6.	Donation withdrawal validation	The application can provide a "Tarik Donasi" button if the amount of donations collected has been reached.	Success

3.5. Discussion

The testing results of the Blockchain-based crowdfunding system application indicate that the system functions effectively across various operational scenarios. Blockchain technology not only provides a simple and secure user experience but also enhances transparency and trust through its decentralized nature. This study demonstrates that the implementation of Blockchain can improve transparency through the following mechanisms:

Immutable Ledger. Blockchain stores all transactions in a permanent record that cannot be altered or deleted. Donations recorded in the public ledger can be verified by anyone through a Blockchain explorer. An example of a public ledger view using a Blockchain explorer is shown in Figure 6.

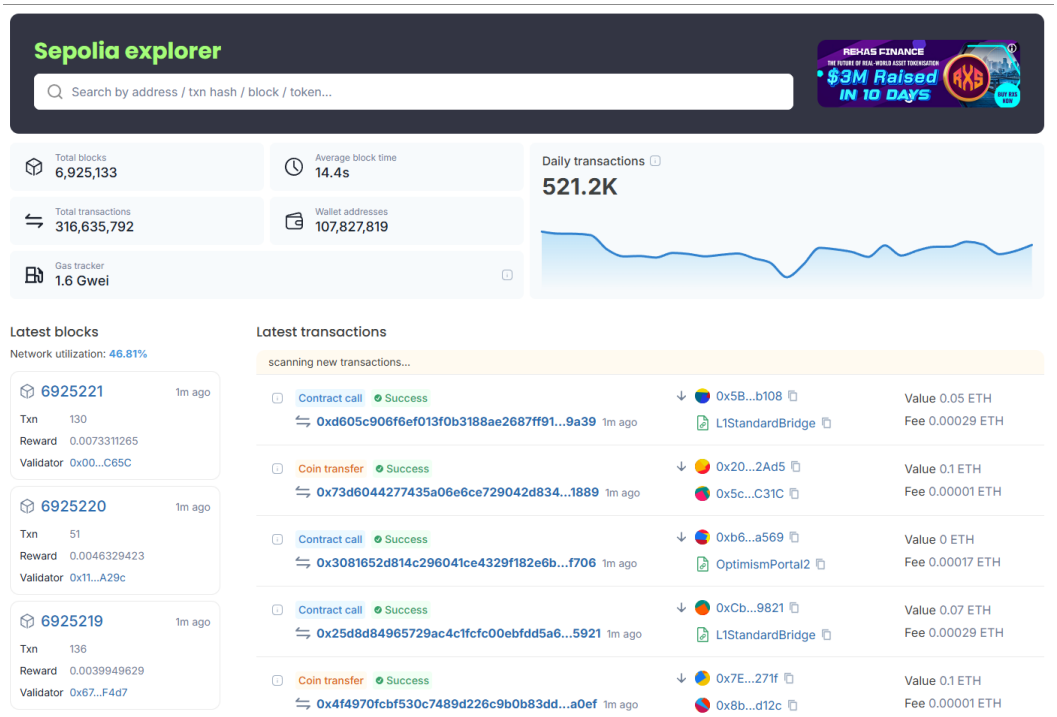
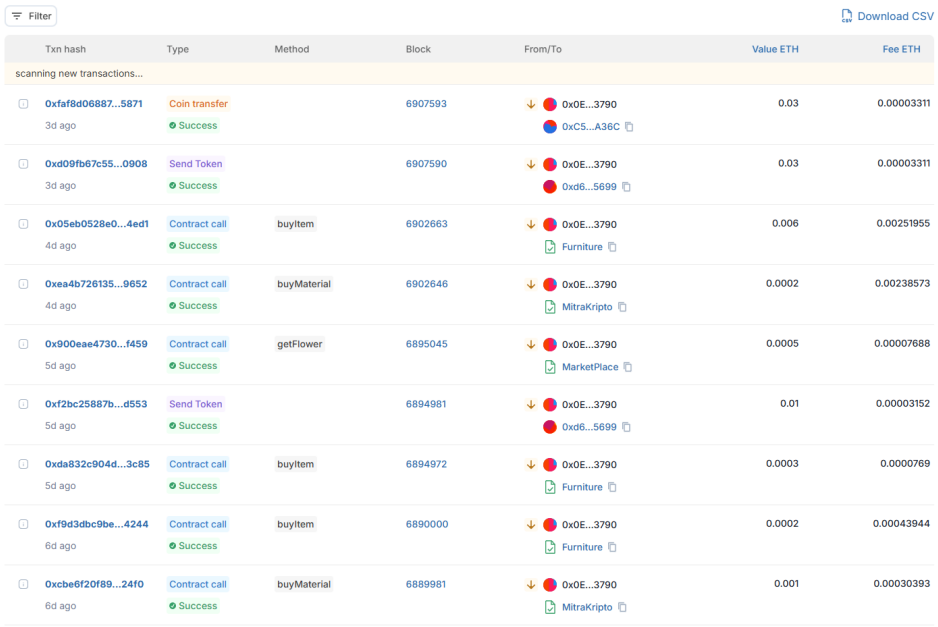


Figure 6. Home Page My Programs Section

Figure 6 illustrates an example of a Blockchain explorer, specifically blockscout.com, used to track Ethereum Sepolia cryptocurrency. By using a Blockchain explorer, users can track transaction history by entering wallet addresses, contracts, transaction hashes, or block numbers into the search feature of the Blockchain explorer.

Public Access to Information. Transaction data in Blockchain technology is publicly accessible, allowing anyone to track the use of funds without requiring third-party authorization. Information such as the sender's address, the amount of tokens, and the transaction time can be directly accessed, ensuring transparency in fund usage according to the campaign's objectives in the crowdfunding system. Donors can use a Blockchain explorer to track transactions by knowing the recipient's wallet address. An example of a transaction list tracked using a Blockchain explorer is shown in Figure 7.



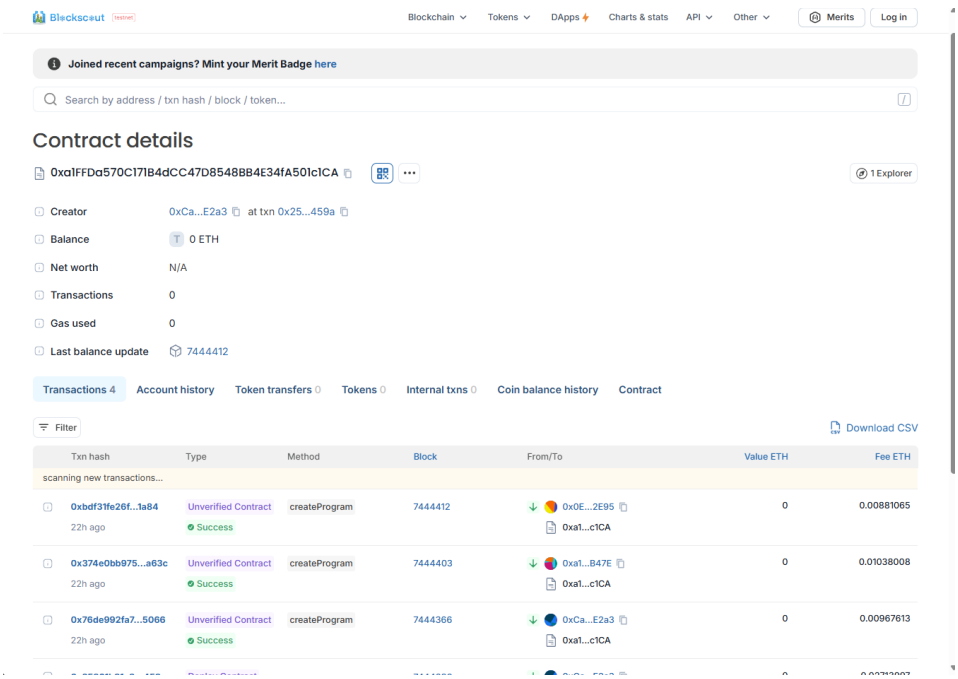
Filter | Download CSV

Txn hash	Type	Method	Block	From/To	Value ETH	Fee ETH
scanning new transactions...						
0xfaf8d06887...5871 3d ago	Coin transfer Success		6907593	0x0E...3790 0xC5...A36C	0.03	0.00003311
0xd09fb67c55...0908 3d ago	Send Token Success		6907590	0x0E...3790 0xd6...5699	0.03	0.00003311
0x05eb0528e0...4ed1 4d ago	Contract call Success	buyItem	6902663	0x0E...3790 Furniture	0.006	0.00251955
0xea4b726135...9652 4d ago	Contract call Success	buyMaterial	6902646	0x0E...3790 MitraKripto	0.0002	0.00238573
0x900eae4730...f459 5d ago	Contract call Success	getFlower	6895045	0x0E...3790 MarketPlace	0.0005	0.00007688
0xf2bc25887b...d553 5d ago	Send Token Success		6894981	0x0E...3790 0xd6...5699	0.01	0.00003152
0xda832c904d...3c85 5d ago	Contract call Success	buyItem	6894972	0x0E...3790 Furniture	0.0003	0.0000769
0xf9d3dbc9be...4244 6d ago	Contract call Success	buyItem	6890000	0x0E...3790 Furniture	0.0002	0.00043944
0xcbe6f20f89...24f0 6d ago	Contract call Success	buyMaterial	6889981	0x0E...3790 MitraKripto	0.001	0.00030393

Figure 7. Donation Usage Tracking

Figure 7 illustrates the tracking of transactions from a donation recipient account as discussed in the previous chapter. To retrieve this information, users must input the desired wallet address into the search feature of the Blockchain explorer.

Use of Smart Contracts. Smart contracts automatically execute specific functions based on predefined code. For instance, donation funds can only be withdrawn if a certain target is achieved or after the deadline has passed. Since smart contracts are transparent and auditable, the entire fund distribution process becomes more open, leaving no room for human interference that could lead to misuse. The smart contract code can be reviewed by independent parties to ensure the contract operates according to the established terms. These automated processes can also be monitored by donors to verify that the donation funds are used appropriately. An illustration of a smart contract in a Blockchain explorer is shown in Figure 8.



Blockscout | Blockchain | Tokens | DApps | Charts & stats | API | Other | Merits | Log in

Joined recent campaigns? Mint your Merit Badge here

Search by address / txn hash / block / token...

Contract details

0xa1FFDa570C171B4dCC47D8548BB4E34fA501c1CA | 1 Explorer

Creator	0xCa...E2a3 at txn 0x25...459a
Balance	0 ETH
Net worth	N/A
Transactions	0
Gas used	0
Last balance update	7444412

Transactions 4 | Account history | Token transfers 0 | Tokens 0 | Internal txns 0 | Coin balance history | Contract

Filter | Download CSV

Txn hash	Type	Method	Block	From/To	Value ETH	Fee ETH
scanning new transactions...						
0xbdf31fe26f...1a84 22h ago	Unverified Contract Success	createProgram	7444412	0x0E...2E95 0xa1...c1CA	0	0.00881065
0x374e0bb975...a63c 22h ago	Unverified Contract Success	createProgram	7444403	0xa1...B47E 0xa1...c1CA	0	0.01038008
0x76de992fa7...5066 22h ago	Unverified Contract Success	createProgram	7444366	0xCa...E2a3 0xa1...c1CA	0	0.00967613

Figure 8. Donation Usage Tracking

To search for a smart contract on a Blockchain explorer, users can find detailed information about the smart contract deployed on the Blockchain network. To access this information, users need to know the unique alphanumeric string of the smart contract address and enter it into the search field of the Blockchain explorer.

Decentralized System. Blockchain operates without the need for a central authority, meaning no single entity can control the entire system or falsify data. Each node in the Blockchain network holds a complete copy of all transactions, ensuring that donation fund management is transparent and free from information monopolies. Decentralization distributes control and access to information across multiple parties, preventing data centralization or manipulation by any single organization.

Real-Time Reporting with Blockchain Explorer. All transactions on the Blockchain can be monitored in real-time using tools like Blockchain explorers. These tools enable anyone to check transaction status instantly, including when a donation transaction was made, by whom, and the amount of tokens transferred. This enhancement in transparency gives donors direct access to monitor their donations, eliminating uncertainty about fund usage and fostering user trust in the system.

4. Conclusions

Based on the results of the study on the implementation of Blockchain Technology to enhance transparency in fundraising systems, the following conclusions can be drawn: Improved Transparency: This study successfully achieved its primary goal of enhancing transparency in fundraising systems through Blockchain technology. All transactions within the system are recorded on an immutable Blockchain ledger, allowing every donation to be tracked and verified by users. Intuitive and Modern Interface: The implementation of React.js and TailwindCSS created a user-friendly interface. This enables users, even those without a technical background, to easily navigate the application, thereby increasing engagement within the fundraising platform. Testing Results: System testing using the Blackbox testing method demonstrated that all application features function as expected. Features such as creating donation programs, processing donation transactions, and withdrawing donated funds operate smoothly, proving that this platform is ready for effective use in a fundraising context.

References

[1] A. Humeniuk, "Fundraising as a Means of Raising Financial Resources for Project Activities," *Sustainable Socio-Economic Development Journal*, vol. 1, no. 3–4, pp. 123–130, Dec. 2023, doi: 10.31499/2786-7838.ssedj.2023.1(3-4).123-130.

[2] S. Widiasih, E. N. Dirman, S. Ramadoan, R. A. Indrawati, and A. Asrijal, "The Urgency Of Crowdfunding In Increasing The Competitiveness Of Msmes In Villages," *Journal Of Human And Education (JAHE)*, vol. 4, no. 4, pp. 392–396, Jul. 2024, doi: 10.31004/jh.v4i4.1263.

[3] E. R. Puspapertiwi and R. S. Nugroho, "Dugaan Penipuan Donasi Kitabisa, Warganet Sebut Nilainya Rp 250 Juta." Accessed: Aug. 20, 2024. [Online]. Available: https://www.kompas.com/tren/read/2024/03/20/161807565/dugaan-penipuan-donasi-kitabisa-warganet-sebut-nilanya-rp-250-juta?page=all# Tanggal Akses 20 Agustus 2024

[4] I. Supriadi, "Transformasi Sistem Perpajakan Menggunakan Teknologi Blockchain Untuk Meningkatkan Transparansi dan Mengurangi Penyimpangan," vol. 2, no. 1, pp. 29–44, Oct. 2024, doi: 10.61261/muctj.v2i1.

[5] M. Wildan, "Blockchain in Elections: Enhancing Security and Transparency." Accessed: Jul. 16, 2024. [Online]. Available: https://sis.binus.ac.id/2024/03/06/blockchain-in-elections-enhancing-security-and-transparency/ Tanggal Akses 16 Juli 2024

[6] J. Ron, C. Soto-Valero, L. Zhang, B. Baudry, and M. Monperrus, "Highly Available Blockchain Nodes With N-Version Design," *IEEE Trans Dependable Secure Comput*, vol. 21, no. 4, pp. 4084–4097, Jul. 2024, doi: 10.1109/TDSC.2023.3346195.

[7] T. P. Utomo, "Implementasi Teknologi Blockchain Di Perpustakaan: Peluang, Tantangan Dan Hambatan," *Buletin Perpustakaan Universitas Islam Indonesia*, vol. 4, no. 2, pp. 173–200, 2021, Accessed: Jul. 27, 2024. [Online]. Available: https://journal.uii.ac.id/Buletin-Perpustakaan/article/view/22232

[8] E. P. Harahap, Q. Aini, and R. K. Anam, "Pemanfaatan Teknologi Blockchain Pada Platform Crowdfunding," *Technomedia Journal (TMJ)*, vol. 4, no. 2, pp. 199–210, Feb. 2020, Accessed: Aug. 07, 2024. [Online]. Available: https://doi.org/10.33050/tmj.v4i2.1108

[9] A. K. Samanta, B. B. Sarkar, and N. Chaki, "A Blockchain-Based Smart Contract Towards Developing Secured University Examination System," *Journal of Data, Information and Management*, vol. 3, no. 4, pp. 237–249, Dec. 2021, doi: 10.1007/s42488-021-00056-0.

[10] A. E. Budiyanto, "Analisis Yuridis Penggunaan Smart Contract Dalam Perspektif Asas Kebebasan Berkontrak," *JOURNAL SAINS STUDENT RESEARCH*, vol. 1, no. 1, pp. 815–827, Oct. 2023, doi: 10.61722/jssr.v1i1.402.

[11] S. Arikunto, *Prosedur Penelitian: Suatu Pendekatan Praktik*, 2010th ed., vol. 14. Jakarta: Jakarta: Rineka Cipta 2010, 2010.

[12] A. Apiyani, Y. Supriani, S. Kuswandi, and O. Arifudin, "Implementasi Pengembangan Keprofesian Berkelanjutan (PKB) Guru Madrasah Dalam Meningkatkan Keprofesian," *JIIP - Jurnal Ilmiah Ilmu Pendidikan*, vol. 5, no. 2, pp. 499–504, Feb. 2022, Accessed: Oct. 31, 2024. [Online]. Available: http://dx.doi.org/10.54371/jiip.v5i2.443

[13] N. D. Setiawan and H. Rasminto, "A Design Science Approach to Aligning Enterprise Information Systems with Organizational Digital Transformation Strategies," *Information System Analysis, Design and Development*, vol. 1 no. 1, pp. 1-8, Jan. 2026, doi: https://doi.org/10.66472/isadd.v1i1.1

[14] A. Noe'man and A. Hiswara, "Design and Development of Information Systems to Enhance Digital Transformation Readiness in Education and Healthcare Organizations," *Information System Analysis, Design and Development*, vol. 1 no. 1, pp. 40-50, Jan. 2026, doi: https://doi.org/10.66472/isadd.v1i1.4

[15] A.B. Trisnawan and M. Sholikhan, "Analyzing the Role of Enterprise Information Systems in Driving Organizational Innovation: A Multi Method Study," *Information System Analysis, Design and Development*, vol. 1 no. 1, pp. 30-39, Jan. 2026, doi: https://doi.org/10.66472/isadd.v1i1.6