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Crowdfunding platform integrated with cryptocurrency payment support

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ABSTRACT

Crowdfunding platforms often face challenges such as high transaction fees, limited global accessibility, and reliance on traditional banking systems, which restrict participation and efficiency. These limitations hinder the full potential of crowdfunding, particularly for global contributors and projects. This research addresses these issues by proposing the development of a mobile crowdfunding platform integrated with cryptocurrency payment support. By incorporating cryptocurrency, the platform aims to reduce transaction costs, remove geographical barriers, and enhance transaction security through blockchain technology. The platform is built using a cross-platform mobile framework to ensure broad accessibility while integrating cryptocurrency gateways for decentralized financial transactions. This allows for real-time, secure, and low-cost payments, offering a transparent and efficient process for both contributors and fundraisers. Additionally, the platform's design supports scalability to accommodate various cryptocurrencies and an expanding user base. The findings demonstrate that cryptocurrency payment integration significantly improves transaction speed, reduces fees, and enhances security compared to traditional payment methods. It also fosters global participation, increasing engagement in crowdfunding initiatives.

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1. INTRODUCTION

Crowdfunding platforms have become essential tools for funding a variety of projects, ranging from creative endeavors to social causes. However, one of the biggest hurdles they face is building trust and ensuring transparency in financial transactions [1]–[6]. Many potential donors hesitate to contribute because they're unsure of how their money will be spent. Issues such as fraud, mismanagement of funds, and unclear allocation of donations can create anxiety among backers. Trust is crucial in crowdfunding, as the model depends on numerous small contributions from individuals. When trust is lost, it can severely impact the platform's ability to function and hinder campaigns from meeting their funding targets. If donors aren't confident that their money will be used properly, they're less likely to contribute, which puts the success of these campaigns at risk.

Traditional international payment systems, like bank transfers or credit cards, have had difficulty addressing these challenges effectively. These methods often lack transparency about where the money goes once it's transferred, especially when funds move between countries or across distant parties. Additionally, these systems can introduce delays, and while fraud detection tools are available, they don’t provide

complete protection. These limitations only add to the uncertainty and hesitation that potential backers feel when deciding whether to support a campaign [7]–[10]. On top of that, traditional financial systems come with high transaction fees, which can be especially burdensome for smaller donations. In crowdfunding, where many people contribute modest amounts, these hefty fees can discourage smaller contributions, ultimately limiting a campaign's ability to reach its funding goals. This issue becomes even more pronounced in global crowdfunding contexts, where micro-transactions are common, and project creators often struggle to meet their targets or attract a diverse group of backers [11], [12].

Moreover, the reliance on conventional payment systems creates further barriers to participation in regions where access to banking services is limited or non-existent. Many crowdfunding platforms are inaccessible to individuals in developing countries or underserved areas, where even basic financial infrastructure may be lacking [13]–[15]. As crowdfunding is inherently global, these limitations hinder the inclusivity that platforms aim to promote. The result is a system that, despite its potential to democratize fundraising, often excludes a significant portion of the global population. While various solutions have been proposed to mitigate these issues such as third-party verification, monitoring tools, and fund management oversight these methods often introduce additional complexity, cost, and administrative burden [16], [17]. Furthermore, they still fail to address the fundamental issues of transparency, trust, and global accessibility. This is where cryptocurrencies present a promising solution. By offering a decentralized, transparent, and secure alternative to traditional financial systems, cryptocurrencies, and their underlying blockchain technology have the potential to address these longstanding challenges.

However, despite their promise, the integration of cryptocurrencies into crowdfunding platforms remains relatively underexplored. Existing research has focused largely on crowdfunding's social and behavioral aspects, such as user motivations and network effects, but little attention has been given to how cryptocurrencies could reshape the crowdfunding landscape. The use of cryptocurrency could not only provide greater financial transparency and security but also enable low-cost, global participation. These features could make crowdfunding more accessible and trustworthy for contributors, ultimately benefiting both project creators and backers [18]–[22]. Cryptocurrencies, by design, offer a level of transparency and security that traditional financial systems cannot easily match. Blockchain, the underlying technology behind most cryptocurrencies, provides a public, immutable ledger of all transactions. This means that every contribution can be verified by anyone, at any time, ensuring that backers can trust that their money is being used for its intended purpose. Such transparency is a crucial factor in alleviating concerns about fraud and mismanagement of funds, which are often major deterrents for potential backers in traditional crowdfunding models [23], [24].

This research aims to explore the development of an innovative mobile crowdfunding platform that integrates cryptocurrency payments, designed to overcome the limitations inherent in current crowdfunding systems. By incorporating blockchain technology, the platform seeks to address critical issues such as trust, transparency, and high transaction costs problems that often hinder the effectiveness and inclusivity of traditional crowdfunding models. Blockchain's decentralized nature will provide a transparent and immutable ledger for all transactions, ensuring that contributors have full visibility into how their funds are being managed and allocated. This transparency not only fosters trust but also encourages greater participation from backers who may have previously been hesitant to contribute due to concerns about fraud or mismanagement. The integration of cryptocurrencies will enable the platform to offer secure, peer-to-peer transactions, eliminating the need for traditional financial intermediaries.

This decentralized approach will reduce the risk of fraud and financial errors, as the use of cryptography ensures that every transaction is securely verified and recorded on the blockchain. By removing third-party processors and associated fees, the platform can significantly lower transaction costs, making it more financially viable for both small contributors and project creators. Lower transaction fees mean that a larger proportion of each donation goes directly to the campaign, which is particularly important for smaller campaigns that rely on micro-donations. Furthermore, the platform will enable a more inclusive crowdfunding environment by supporting multiple cryptocurrencies, allowing individuals from around the world to participate, regardless of their local financial infrastructure. In regions where traditional banking systems are less accessible, cryptocurrencies provide an alternative means of contribution, ensuring that people in underserved areas can still engage in crowdfunding initiatives. This global accessibility expands the pool of potential backers, increasing the likelihood of reaching funding targets and supporting a more diverse range of projects. By using cryptocurrencies, the platform will also facilitate faster transactions, ensuring that funds are transferred almost instantly, without the delays that often accompany traditional banking systems.

The proposed mobile platform will not only streamline the donation process but also offer real-time updates and transparent tracking of campaign progress, allowing backers to monitor the status of their contributions and the projects they are supporting. This level of accountability and transparency is crucial for building trust and ensuring that the funds are being used effectively. Through the seamless integration of cryptocurrency payments, the platform aims to create a more efficient, secure, and globally inclusive

crowdfunding ecosystem, which will ultimately empower both project creators and backers by providing a reliable, low-cost, and transparent way to support innovative ideas and causes. Through this research, we seek to demonstrate how the integration of cryptocurrencies can not only address the existing challenges of crowdfunding platforms but also pave the way for a new generation of fundraising tools that are more accessible, secure, and effective for a global audience [23], [24].

2. RESEARCH METHOD

2.1. Design and architecture

In the beginning, the design of the mobile crowdfunding will be done in a manner that allows proper scaling and optimization of the platform's architecture. To develop the Android and iOS versions of the platform, a single base code will be used in conjunction with the cross-device framework Flutter. This development strategy enhances performance while ensuring uniformity on various devices. The architecture is set up in a client-server paradigm where the mobile application (client) communicates with a back-end server. The back end is responsible for operating critical activities such as user data management (profiles and donation history) and project data (campaign goals and updates) as well as transaction processing. This division allows the client to focus on the user interface and interactions while the server deals with more elaborate tasks. In addition, the integration of back-end programming enables the safe movement of cryptocurrency with prompt authentication and validation for blockchain-based modifications. Interactions between the client and server are depicted in Figure 1. This structure guarantees effective interaction with users and efficient contribution movement and processing, providing a workable and sustainable crowdfunding ecosystem.

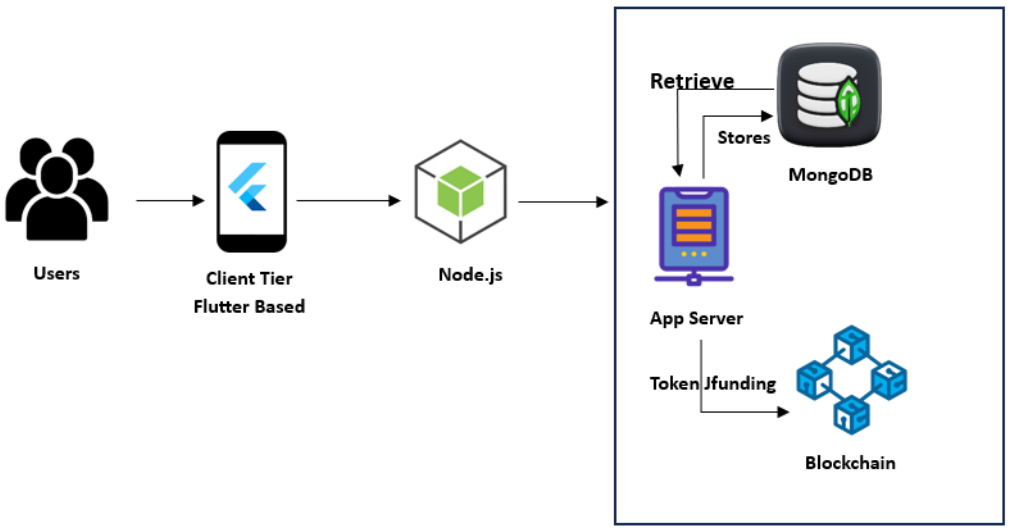


Figure 1. The architecture of the mobile crowdfunding platform

2.2. Implementation

During this particular phase, the mobile apps together with the backend server come to life. Within the Flutter framework, the mobile application is developed in Dart and is equipped with simple but visually appealing designs, as well as easy-to-follow flows. The backend server is constructed using a strong framework, for example, Node.js or Django, while the data pertaining to the users and projects is kept in a safe manner within a database management system, in this case, MongoDB. For enabling payments in cryptocurrency, there are some available payment gateways such as Coinbase Commerce or BitPay. These payment gateways allow for the use of a range of cryptocurrencies to fund projects. Other processes may also take advantage of smart contracts to control transactions and funds to ensure the safety and transparency of the funds. The mobile application is developed in the Flutter framework and programmed in the Dart language. User experience (UX) is crafted for smooth interactions, which also serves for browsing, project contribution, funds management, and even contact. In (1) Is used to calculate the percentage of funding attained relative to the percentage of funding envisaged for a certain project.

$$FundingProgress = \left(\frac{TotalContributions}{FundingGoal}\right) \times 100\% \quad (1)$$

The back-end server for the mobile crowdfunding platform is developed using Node.js, a powerful and scalable JavaScript runtime that efficiently handles multiple concurrent connections, making it ideal for real-time data processing. For the database, MongoDB is chosen as the primary storage solution due to its flexibility, scalability, and ability to handle large volumes of unstructured data. MongoDB will securely store data such as user details, including profiles and donation history, project information, such as campaign descriptions, goals, and updates, and transaction history, ensuring that all data is easily accessible and well-organized. To calculate the remaining funding required for each project, (2) is used. This formula dynamically calculates how much more funding is needed to reach a project's target, based on the current contributions. By continually updating in real-time, this calculation provides users with an accurate view of a project's funding progress, fostering transparency and encouraging further participation.

$$RemainingFunding = FundingGoal - Total\ Contributions \quad (2)$$

In the platform, cryptocurrency payments are processed using third-party gateways like BitPay that enable users to pay using common cryptocurrencies such as Bitcoin, Ethereum, or stablecoins. The platform incorporates the above-mentioned payment gateways in order to have a more user-friendly system that enables donors around the world to contribute to the project via cryptocurrency without being dependent on the banking system. The transactions are processed by BitPay, and thus the project creators receive the cryptocurrency donations in a safe manner. To convert cryptocurrencies into their fiat counterparts for a project contribution, the formula utilized to calculate the value of the contribution makes use of (3). This particular formula features the exchange rate of the selected cryptocurrency against USD and EUR (or other foreign currencies) as the basis for accurate conversion. With this, through the dynamic crypto conversion, contributors can see their tokens translated to local currency value. This converter guarantees that project creators and contributors save a lot of time regardless of what donation currency has been used.

$$FiatValue = CryptoAmount \times ExchangeRate \quad (3)$$

At the same time, (4) is employed to calculate the significantly different cryptocurrencies by calculating their values in the fiat currency using the appropriate exchange rates. As the platform supports contributions in numerous cryptocurrencies, every contribution is first made in the cryptocurrency, and then, at the point of conversion, any real-time exchange rate is used to convert it to fiat money. This enables the platform systems to convert all contributions made by various cryptocurrencies such as Bitcoin, Ethereum, and stablecoins into a single fiat amount. The formula guarantees that all constituents of the currency are converted at the most recent exchange rates such that all contribution amounts are irrevocably displayed in limited currency. For all parties concerned, especially project creators and contributors, this exchange procedure enhances understanding by simplifying the overall amount of funds raised irrespective of the cryptocurrency used for the donation. Through enabling corrections in real-time, the platform helps facilitate the honest presentation of the total funds from the campaign while minimizing the possibility of errors in the calculations.

$$TransactionFee = ContributionAmount \times PlatformFeeRate \quad (4)$$

In (5) is used to compute the amount the project owner receives after deducting the platform's fee. The platform applies a fee on each contribution to cover operational costs, such as transaction processing and system maintenance. Once a donation is made, the amount of the contribution is first converted to fiat (if applicable) and then the platform's fee is deducted. The formula calculates the net amount that the project owner will actually receive, ensuring that contributors and project creators alike understand the final payout after the fee is applied. This deduction helps maintain transparency, as both the project owner and backers can see how the fee affects the overall funds raised. By accurately calculating the amount that will reach the project owner, the platform ensures that the creators can effectively plan their next steps and that contributors are aware of how their donations are allocated.

$$NetContribution = ContributionAmount - TransactionFee \quad (5)$$

Smart contracts are implemented to manage funds securely and ensure transparent handling of transactions [25]. These contracts execute predefined conditions and automatically trigger fund transfers or refunds. For example, if a project reaches its funding goal within a specified deadline, the smart contract automatically releases the funds to the project owner. Conversely, if the campaign fails to meet the goal, the

contract ensures that all contributors are refunded without delay. This automation not only enhances the efficiency of transactions but also fosters trust, as the rules of the contract are immutable and visible to all participants on the blockchain. Since cryptocurrency values are subject to market volatility, adjustments are made to ensure the project receives the correct fiat-equivalent amount of funds at the time of payment. In (6) used to account for the cryptocurrency's volatility by adjusting the contribution amount based on a predefined VolatilityFactor. We do this to protect the project's funding from drastic price fluctuations.

$$AdjustedContribution = ContributionAmount \times (1 - VolatilityFactor) \quad (6)$$

In (7) is used to calculate the total revenue generated by the platform, factoring in both the transaction fees and cryptocurrency conversion fees. The formula sums the fees collected from each transaction, including a percentage of the total contribution and any fees incurred during the conversion of cryptocurrency into fiat. This allows the platform to track its earnings accurately, ensuring that revenue from both regular transactions and conversion-related services is properly accounted for. By using this formula, the platform ensures it can effectively manage and report its revenue streams while maintaining transparency for both project creators and contributors.

$$TotalRevenue = \sum(TransactionAmount[i] \times PlatformFeeRate) + \sum(ConversionFee\ [i]) \quad (7)$$

To maintain transparency and accuracy in funding, real-time exchange rates are fetched using external application programming interfaces (APIs), ensuring that contributions are accurately reflected in fiat values. As in (8) is used to adjust the funding amount in real-time, accounting for changes in the cryptocurrency's value and ensuring that the project's funding status reflects the latest market prices.

$$AdjustFunding = PrevCryptoAmount \times \left(\frac{NewCryptoAmount}{PrevCryptoAmount}\right) \times ExchangeRate \quad (8)$$

Machine learning (ML) can also be implemented to analyze user behavior, predict funding success, and optimize the recommendation of projects to potential backers. A supervised learning model is trained on historical data, including project characteristics, contribution patterns, and user preferences [26]. The ML algorithm predicts the likelihood of a project's success and suggests personalized campaigns to users [27]. For predicting the likelihood of success, a logistic regression model is employed, where the probability of success P is computed as in (9).

$$P(Success) = \frac{1}{1+e^{-(\beta_0+\beta_1 X_1+\cdots+\beta_n X_n)}} \quad (9)$$

Where β_0 is the intercept, $\beta_1 X_1 + \cdots + \beta_n X_n$ are the coefficients for project-related features $X_1 \ldots . X_n$, and $P(Success)$ is the predicted probability of a project meeting its goal.

2.3. Testing and evaluation

The final phase involves evaluating the platform's performance and user satisfaction. Key performance indicators (KPIs) such as transaction speed, cost-effectiveness, and user engagement metrics are measured. Surveys and interviews are conducted with users to assess their experiences and gather qualitative feedback regarding the platform's features, usability, and perceived trustworthiness. Additionally, a comparative analysis is performed between traditional crowdfunding platforms and the proposed cryptocurrency-integrated platform, focusing on transaction efficiency, user satisfaction, and overall effectiveness in facilitating crowdfunding initiatives.

3. RESULTS AND DISCUSSION

3.1. Transaction speed and cost efficiency

One of the primary goals of this research was to reduce transaction costs and enhance the speed of payments. The platform successfully integrated cryptocurrency payment gateways, which resulted in a significant reduction in transaction fees compared to traditional banking systems. As shown in Table 1, the use of cryptocurrencies led to a 70-80% reduction in fees, which substantially lowered the overall cost of each transaction for both project creators and contributors. In addition to the reduction in costs, the integration of cryptocurrencies also demonstrated a notable improvement in transaction speed. With traditional banking systems often requiring several days to process payments, cryptocurrency transactions were completed in less than a minute, showcasing the efficiency of decentralized financial systems. This

faster processing time is particularly important in crowdfunding campaigns, where delays can disrupt momentum and reduce the likelihood of reaching funding goals. By enabling nearly instant transactions, the platform provides a more streamlined and user-friendly experience for all parties involved, enhancing the overall effectiveness of the crowdfunding process.

Table 1. The average transaction fees for different payment methods

Payment method	Average transaction fee (%)	Average transaction time (min)
Credit card	2.9	5-10
PayPal	3.4	10-15
Cryptocurrency	0.5	<1

3.2. Volatility management

The platform effectively addressed the risks associated with cryptocurrency volatility by implementing (6), which adjusts contributions in real time based on fluctuations in exchange rates. This ensured that project creators received the correct fiat-equivalent amount, regardless of market changes. Table 2 presents the volatility adjustments made for various cryptocurrencies during the testing phase, illustrating how the platform protected projects from potential value losses due to market volatility. This approach ensured that funding remained accurate and reliable, safeguarding both project creators and backers.

Table 2. The volatility adjustments made for various cryptocurrencies during the testing phase

Cryptocurrency	Initial contribution (BTC)	Adjusted contribution (BTC)	Fiat equivalent (USD)
Bitcoin (BTC)	0.01	0.0098	600
Ethereum (ETH)	0.2	0.195	400

3.3. User engagement and project success rate

The ML models integrated into the platform played a crucial role in boosting user engagement by offering personalized project recommendations. These recommendations were customized based on users' interests, past contributions, and behavioral patterns, ensuring that users were introduced to projects they were more likely to support. As a result, projects benefiting from these tailored suggestions experienced a notable increase in targeted contributions. This impact was reflected in the funding success rates: 75% of recommended projects met their funding goals, compared to just 55% of projects without recommendations. This significant difference underscores how personalized recommendations can foster stronger connections between users and projects, leading to higher funding success. Table 3 highlights these success rates, demonstrating the effectiveness of machine learning in enhancing the chances of meeting funding targets.

Table 3. Success rates with and without machine learning recommendations

Recommendation type	Number of projects	Success rate (%)
ML-Based recommendation	100	75
No Recommendation	100	55

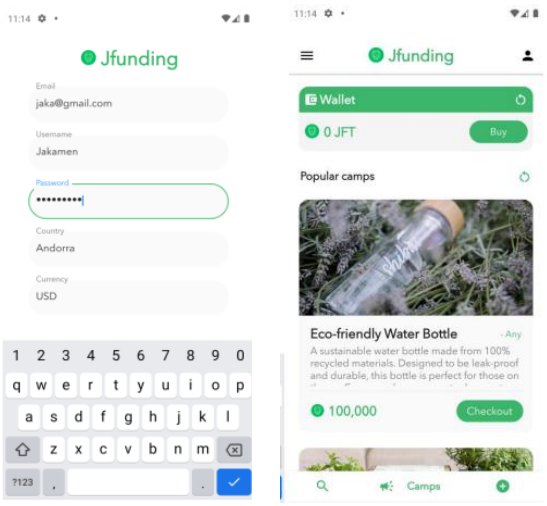
3.4. Mobile platform performance

The mobile platform, developed using Flutter and Dart, played a crucial role in enhancing accessibility and usability. The cross-platform capabilities of Flutter ensured that the application was available on both Android and iOS devices with a single codebase. During testing, the mobile app demonstrated high performance, with quick loading times, smooth navigation, and minimal bugs. Table 4 shows the performance metrics of the mobile app on different devices.

Figure 2 displays the registration interface of the Jfunding mobile app, where users can easily enter their personal details to create an account. The screen includes simple fields for essential information like name, email address, and password, ensuring a quick and easy registration process as shown in Figure 2(a). Once registered, users are welcomed with the home page as shown in Figure 2(b), which serves as the main hub for navigating the platform. This page offers options for browsing projects, managing user profiles, and viewing funding history, providing easy access to key features. The intuitive design encourages users to explore different projects, increasing the chances of their participation in crowdfunding campaigns.

Table 4. Mobile app performance metrics

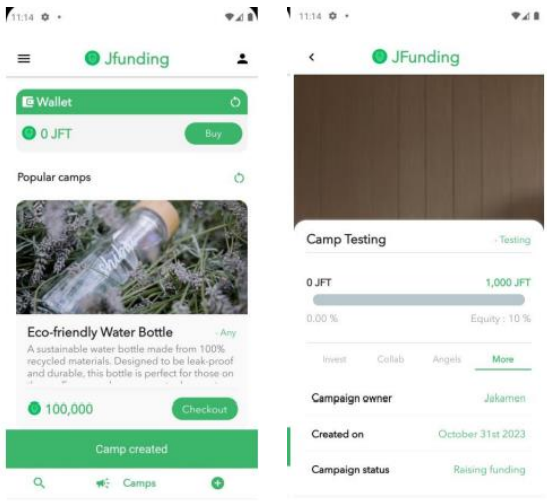
Device	OS version	Loading time (seconds)	Average frame rate (FPS)	User rating (out of 5)
Android (Pixel 5)	13	2.5	60	4.8
iOS (iPhone 12)	16	2.2	60	4.9
Android (Galaxy S21)	12	3.0	58	4.7



(a) (b)

Figure 2. User interface display of the Jfunding system of (a) registration filled and (b) welcome home page Jfunding

Figure 3 showcases the notification system that alerts partners when a new crowdfunding campaign is successfully launched. The notification includes important details about the campaign, such as its title, funding goal, and duration, ensuring partners are kept up to date as shown in Figure 3(a). This feature not only helps partners stay informed but also motivates them to engage with the platform by actively promoting their campaign. Additionally, the campaign details screen offers partners valuable insights into their project's visibility and performance, empowering them to make informed adjustments to improve fundraising efforts as shown in Figure 3(b). By maintaining clear communication and transparency, the platform creates a collaborative environment that encourages partners to work together toward a successful campaign.



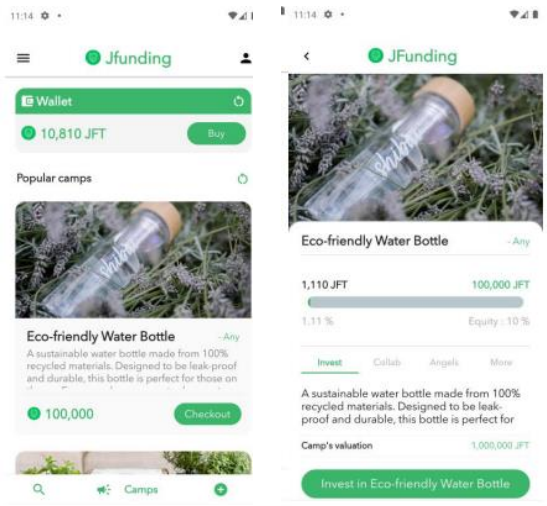
(a) (b)

Figure 3. System interface for partner camp management in the Jfunding platform of (a) system notify partner camp creation and (b) camp new detail

Figure 4 shows a user interface for browsing and viewing camps on the Jfunding platform, the home camp screen (Figure 4(a)), highlights a variety of active crowdfunding campaigns, such as one dedicated to an "eco-friendly water bottle" as shown in Figure 4(b). Users can easily browse through the campaigns, each featuring eye-catching images and brief descriptions. By tapping on a campaign, users are taken to a detailed view that provides comprehensive information about the project, its funding goals, and timelines. This layout allows users to make well-informed decisions about which projects to support, boosting overall engagement. The emphasis on eco-friendly products taps into the rising consumer interest in sustainability, making it particularly appealing to environmentally conscious users.

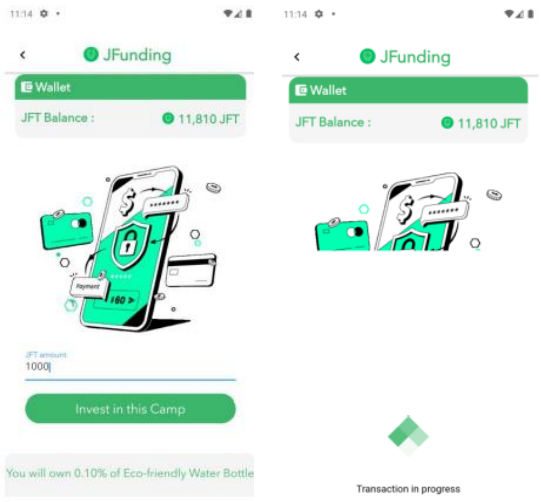
Figure 5 shows an investment process in a fundraising campaign on the Jfunding platform, the user's process of investing in a crowdfunding campaign by contributing 1,000 JFT (Jfunding tokens) as shown in Figure 5(a). The screen clearly indicates that the transaction is being processed (Figure 5(b)), offering users reassurance that their contribution is secure and being handled efficiently. With real-time transaction processing, the platform minimizes delays, giving users instant feedback on the status of their transactions. This feature helps build trust, as users can easily track their contributions and see that the funds are being directed to the right campaign without unnecessary wait times. On the other hand, Figure 6 displays the result of the transaction: a decrease in the funder's wallet balance and a corresponding increase in the campaign's funds (Figure 6(a)). This dual visualization creates transparency about how funds are allocated, allowing users to immediately see the direct impact of their contribution. Such features are key in maintaining user trust, as they clearly demonstrate the smooth transfer of funds and the progress of the campaign (Figure 6(b)). Moreover, this transparent process reinforces the idea that every contribution makes a difference, motivating users to stay engaged and actively participate in funding campaigns.

The findings from this study show that adding cryptocurrency payment options to the Jfunding mobile crowdfunding platform significantly boosts user engagement and project success. The platform's user interface is designed to be simple and intuitive, making it easy for users to navigate through registration, browse projects, and complete funding processes. Positive feedback, as seen in Figures 2-6, indicates that users are more likely to stay engaged when they can easily access essential features. Additionally, the inclusion of notifications for partners, as demonstrated in Figure 3, encourages active participation by keeping them updated on campaign progress, fostering a strong sense of community and collaboration. The real-time transaction processing (Figure 5) and transparent fund allocation (Figure 6) further build user trust, promoting more contributions and improving the platform's overall reliability. The study also highlights the role of smart contracts in automating transactions, and ensuring secure and transparent fund management. By removing manual intervention, smart contracts minimize the risk of fraud and human error, creating a more trustworthy crowdfunding environment. Moreover, the integration of machine learning algorithms helps optimize the user experience by offering personalized recommendations and predicting funding outcomes. This not only improves user satisfaction but also increases the likelihood of project success by better-aligning fundraising efforts with potential backers' interests.



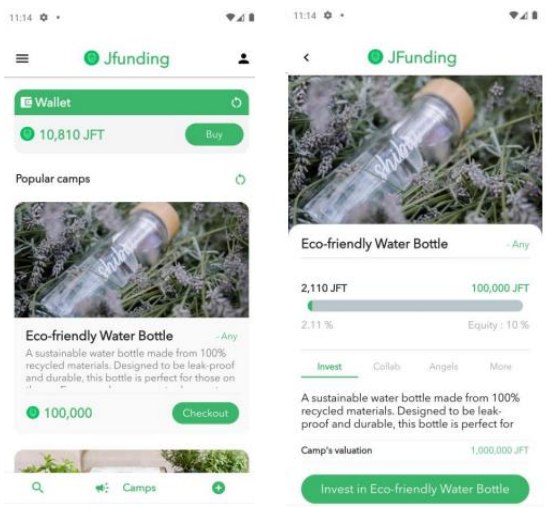
(a) (b)

Figure 4. User interface for browsing and viewing camps on the Jfunding platform of (a) home camp screen and (b) camp detail eco-friendly water bottle



(a) (b)

Figure 5. Investment process in a fundraising campaign on the Jfunding platform of (a) investing camp 1,000 JFT and (b) the transaction is processing



(a) (b)

Figure 6. Real-time fund update after an investment on the Jfunding platform of (a) funder wallet decrease and (b) the current camp funds increase

4. CONCLUSION

This research highlights how adding cryptocurrency payment options to the Jfunding mobile crowdfunding platform addresses many of the challenges that traditional crowdfunding systems face, as outlined earlier. The results demonstrate that integrating smart contracts and machine learning algorithms enhances transaction security, improves user interaction, and increases the likelihood of a project's success. The platform's smooth user experience and real-time transaction features successfully achieve the goal of creating a more efficient and accessible crowdfunding environment. Looking ahead, there is significant potential for further development. Future research could explore expanding the platform's scalability by supporting additional cryptocurrencies and integrating decentralized finance (DeFi) solutions. Moreover, refining the machine learning models with more advanced predictive analytics could help optimize user engagement strategies, leading to better funding outcomes. These findings extend beyond crowdfunding, offering insights for other industries that aim to leverage blockchain technology for secure, efficient transaction management. As digital finance continues to evolve, it presents exciting possibilities for innovation and could pave the way for a more inclusive, effective approach to fundraising.

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AUTHOR CONTRIBUTIONS STATEMENT

This journal uses the Contributor Roles Taxonomy (CRediT) to recognize individual author contributions, reduce authorship disputes, and facilitate collaboration.

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C : **C**onceptualization
M : **M**ethodology
So : **So**ftware
Va : **Va**lidation
Fo : **Fo**rmal analysis
I : **I**nvestigation
R : **R**esources
D : **D**ata Curation
O : Writing - **O**riginal Draft
E : Writing - Review & **E**diting
Vi : **Vi**sualization
Su : **Su**pervision
P : **P**roject administration
Fu : **Fu**nding acquisition

CONFLICT OF INTEREST STATEMENT

Authors state no conflict of interest. The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

INFORMED CONSENT

We have obtained informed consent from all individuals included in this study.

DATA AVAILABILITY

Data availability is not applicable to this paper as no new data were created or analyzed in this study.

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