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Integrating Web 2.0 and Web 3.0 for the Development of a Crowdfunding Application

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ABSTRACT: This paper offers a thorough examination of how Web 2.0 and Web 3.0 technologies were used into the creation of a crowdfunding application. The suggested application intends to build a dynamic and safe platform for project creators and backers by fusing the user-centered, collaborative aspects of Web 2.0 with the decentralized infrastructure and security features of Web 3.0. The fusion of Web 3.0's decentralised financing mechanisms and smart contracts with Web 2.0's social engagement elements, such as project sharing and user involvement, enables improved user engagement, transparent transactions, and increased confidence within the crowdfunding ecosystem. The integrity of the crowdfunding process is further strengthened and encouraged through reputation systems, tokenization, and decentralized identification systems based on Web 3.0 and Web 2.0 user-generated content. While there are intriguing prospects for combining these two web paradigms, a successful implementation requires addressing issues with scalability, user uptake, regulatory constraints, and technical complexity. The results of this study add to our understanding of how Web 2.0 and Web 3.0 can be successfully merged to create a strong crowdfunding application that encourages creativity, teamwork, and safe transactions throughout the world's crowdfunding communities.

KEYWORDS: Web 2.0, Web 3.0, crowdfunding, application development, user engagement, security, blockchain, Ethereum, decentralized transactions.

I. INTRODUCTION

Crowdfunding

The way people and organisations finance their creative endeavours has been revolutionised by crowdfunding. It enables project creators to enlist the financial assistance of numerous people, frequently referred to as backers, who make varied financial contributions to the project. Crowdfunding platforms have been increasingly popular and successful as a result of the web's development, which has also made it easier for people to access them and streamlined the fundraising process. The second generation of the World Wide Web, known as Web 2.0, encouraged user participation, collaboration, and social engagement, bringing about a paradigm shift in online interactions. It included a variety of lively and interactive elements, including social media, user-generated content, and online communities. Web 2.0 platforms made it possible for users to communicate with one another, share information, and produce rich content, making the internet a more interactive and user-centric environment.

The next phase in the development of the internet is represented by Web 3.0, often known as the semantic web or decentralized web. Decentralization, interoperability, and the use of blockchain technology are highlighted. Decentralized applications (DApps) can be created using Web 3.0 and function on a peer-to-peer network, utilising the security and smart contracts of blockchain for private and transparent transactions. The creation of a strong crowdfunding application holds significant promise for the merging of Web 2.0 and Web 3.0 technologies. It is possible to develop a strong and cutting-edge platform by fusing the user-centered, collaborative aspects of Web 2.0 with the decentralised infrastructure and security characteristics of Web 3.0. Numerous advantages, such as higher user engagement, increased security, decreased reliance on middlemen, increased transparency, and universal accessibility, may result from this integration.

Web 2.0

Web 2.0 is a substantial transition from static, one-way communication websites to collaborative, dynamic platforms that promote user interaction and participation. It brought interactive digital experiences, user-generated content, and social media. Social networking, blogging, content sharing, and online communities are some of Web 2.0's main characteristics. Web 2.0 platforms give crowdfunding project creators the chance to reach a wider audience and get feedback from prospective backers. By incorporating social sharing tools, project creators may use their supporters'

networks to promote their initiatives on social media and through other means. The transparency and trustworthiness of the crowdfunding process are enhanced by user-generated content in the form of comments and reviews. Additionally, Web 2.0's interactive features make it possible for project developers and supporters to have direct conversations, building a sense of community and collaboration. Backers are able to express interest in the projects they are interested in, ask questions, and make comments. The social collaboration feature of Web 2.0 platforms increases the bond between project creators and backers, making the crowdfunding experience more interesting and involved.

Web 3.0

A paradigm change towards decentralisation, interoperability, and the use of blockchain technology is represented by Web 3.0. It strives to develop an online ecosystem that is more transparent, safe, and open. Decentralized applications (DApps), smart contracts, and decentralized identities are just a few of the ideas that Web 3.0 brings.

Web 3.0 significantly enhances security and transparency in the crowdfunding space. The decentralized and tamper-resistant record-keeping capabilities provided by blockchain technology, the cornerstone of Web 3.0, ensure the integrity of transactions. The blockchain-based smart contracts, which are self-executing and unchangeable agreements, automate and secure the crowdfunding process. These contracts make it easier to collect and distribute money by offering an unreliable mechanism that does away with the need for middlemen and lowers the risk of fraud.

Integration of Web 2.0 and Web 3.0 for Crowdfunding

A powerful crowdfunding application can be developed in a variety of ways thanks to the combination of Web 2.0 and Web 3.0 technologies. A platform that utilises the social interaction and cooperation of Web 2.0 with the security, transparency, and decentralised nature of Web 3.0 can be developed by combining the advantages of both paradigms. To promote user interaction and project discovery, Web 2.0 features like project sharing, comment sections, and user profiles can be added into the integrated crowdfunding platform. Users can engage with project creators directly, share projects within their social networks, and offer comments and suggestions. This social engagement component strengthens the bond between funders and project creators, producing a welcoming and active crowdfunding community. Web 3.0 technologies can be used at the same time to offer safe transactions and decentralized funding systems. In order to ensure transparent funding distribution and eliminate the need for middlemen, smart contracts can automate the transfer of payments between project developers and backers. Blockchain technology ensures the accuracy and permanence of transactions, boosting dependability and transparency within the crowdfunding ecosystem. Further enhancing the credibility of the crowdfunding platform is the incorporation of reputation systems based on Web 3.0 decentralized identification systems and Web 2.0 user-generated content systems. Based on their interactions and contributions, users can develop reputations, which can then be displayed to foster trust within the community. Tokenization, a Web 3.0 technology, can be used to encourage active involvement and give backers access to special benefits. All things considered, the incorporation of Web 2.0 and Web 3.0 technologies into the crowdfunding application produces a solid platform that helps both project developers and backers. A vibrant, safe, and inclusive crowdfunding environment can be created by combining social engagement, decentralised funding, reputation systems, and tokenization.

In order for Web 2.0 and Web 3.0 technologies to be successfully integrated, it is necessary to overcome issues with scalability, user adoption, regulatory considerations, and technological complexity. However, integrating the advantages of these two online paradigms has enormous potential for creating a crowdfunding application that encourages creativity, teamwork, and secure transactions among the world's crowdfunding community.

II. RELATED WORK

Literature Survey

Web 2.0 technology has a variety of crowdfunding platforms, including Kickstarter, GoFundMe, and others. Every donation carries an additional cost. A fee of 5% of the total cash raised in a crowdfunding campaign is levied by Kickstarter. Credit card processing fees are also charged, and they amount to 3% of the pledge total + \$0.20 per pledge. A reduced micro-pledge charge of 5% plus \$0.05 per pledge is applied to commitments under \$10 [1]. The middleman fee can be removed by using blockchain, more specifically Ethereum. The donor should just be required to pay a minimal gas fee. This is due to the fact that smart contracts will handle money transfers in place of a middleman. On the Ethereum blockchain, smart contracts are pieces of self-executing code [2]. There are various forms of crowdsourcing, including equity-based, reward-based, and donation-based models. All of these forms of crowdfunding can be implemented using blockchain. All of the aforementioned crowdfunding campaigns are governed by an



immutable smart contract [3]. Every transaction on Ethereum may be verified by anyone who has access to the public ledger. The public may follow the flow of funds when a campaign receives funds and how the campaign creator uses those funds for a cause. This works well for campaigns involving charities where the public can monitor the funds that the organisation spends [4]. Blockchains such as Ethereum are used to accomplish this transparency. The first successful application of blockchain technology and cryptocurrency is Bitcoin. But that lacks the smart contract feature. For writing business logic, smart contracts are supported by Ethereum [5]. The standard crowdfunding platform asks for information like the user's name, email address, and mobile number. These people might be the target of a cyberattack if there is a data leak. Decentralised applications, however, just require the user's public address in order to interact[6]. In the decentralised platform, cryptocurrency transactions will take place. When compared to the conventional financial system, it is instantaneous. Transacting across borders does not need an additional step[7]. The donor may pay a slightly higher gas fee and transactions may take longer if the blockchain network is congested. These expenses and times can be disregarded when compared to the conventional system[9]. Blockchain will offer a trustworthy, secure, and reliable system. However, the website won't have the interactive features seen in the most popular traditional crowdfunding tools, such as likes, remarks, polls, and progress update[8]. These could be achieved using blockchain, but the user would need to pay some ETH for each write operation. Web 2.0 technologies are thus the most appropriate for these interactions. Adoption is a key component of the platform's success. To fully trust the system, ordinary people must be aware of blockchain technology and the differences between Web 2.0 and Web 3.0. Thus, grasping the fundamentals of blockchain technology is essential to success [10].

Conclusion of Literature Survey

In conclusion, blockchain technology has a lot to offer crowdfunding platforms in terms of security and transparency. Crowdfunding campaigns can do away with middlemen by using smart contracts on the Ethereum blockchain, guaranteeing that money is handled securely and effectively. Blockchain's immutability and public ledger capabilities enable transparent tracking of monies, which is especially useful for fundraising efforts for charity causes because it allows the general public to see how the money is used. It's crucial to remember that blockchain-based crowdfunding platforms could not have all the interactive features. The cost of each transaction makes it difficult to include features like likes, comments, polls, and progress updates on the blockchain. Users would have to pay petrol fees for each operation in order to complete these activities, which might not be viable or practicable. Traditional web 2.0 technologies like Node.js, Express, and SQL databases can be used to get around this restriction. These technologies offer the essential user engagement features and interactive components without raising the price for each transaction.

Consequently, a combined strategy that makes use of both web 2.0 and web 3.0 technologies can produce a crowdfunding system that is more comprehensive. Effectively integrating these technologies would enable crowdfunding platforms to provide users with increased user engagement, security, and transparency, resulting in a more robust and inclusive crowdfunding experience.

III. METHODOLOGY

Motivation

The motivation behind incorporating Web 2.0 and Web 3.0 technologies into the construction of a crowdfunding application is to give project creators and backers access to a more sophisticated, engaging, and secure platform. There are drawbacks to traditional crowdfunding platforms in terms of user involvement, security, and transparency. The advantages of Web 3.0 and Web 2.0 can be used to create a new generation of crowdfunding applications that can get around these restrictions.

Enhancing user participation and collaboration within the crowdfunding ecosystem is one of the main drivers. Social networking, user-generated content, and interactive features provided by Web 2.0 completely changed how people engage online. By including these capabilities in crowdfunding platforms, project developers can reach a wider audience of potential supporters, take advantage of social media sharing, and get insightful comments and recommendations. On the other side, supporters can take an active role in the crowdfunding process by interacting with project creators, offering feedback, and developing a stronger sense of ownership over the initiatives they support. A lively and encouraging community is fostered by this enhanced interaction, which encourages innovation and teamwork.

Taking care of the security and transparency issues that traditional crowdfunding platforms encounter is another reason. A high level of security and confidence in transactions is provided by the decentralised infrastructure of Web 3.0, which is supported by smart contracts and blockchain technology. The danger of fraud and improper money

management can be considerably decreased by including Web 3.0 into the crowdfunding application. Fund transfers are automated via smart contracts, guaranteeing secure and unchangeable transactions. With the immutable record of transactions provided by blockchain technology, the crowdfunding ecosystem is more transparent and accountable.

Additionally, the incorporation of reputation systems based on Web 3.0 decentralised identification systems and Web 2.0 user-generated content acts as motivation to create a trustworthy environment. Users can develop and display their reputations via reputation systems based on their interactions and contributions. This not only strengthens community trust but also enables project developers and backers to make better informed choices. By giving users authority over their personal data, decentralized identification systems reduce privacy issues and promote a safe atmosphere for crowdfunding activities.

The reasoning for the use of Web 2.0 and Web 3.0 technologies in crowdfunding originates from the conviction that the union of social interaction, decentralized funding, reputation management, and tokenization can open up new avenues and revolutionise the crowdfunding industry. A strong and inclusive crowdfunding application can be created by utilising the power of these online paradigms, enabling worldwide creativity, collaboration, and safe transactions.

Technology Stack

1. Solidity 0.8.9:

Solidity is a programming language that was created exclusively for creating smart contracts for the Ethereum network. It supports inheritance, libraries, and sophisticated user-defined types and is statically typed. Solidity is essential for defining the logic and conduct of smart contracts, including their interactions with other contracts, functions, events, and data structures.

2. Javascript ES6:

The flexible programming language JavaScript enables dynamic and interactive functionality on web pages. It serves as the framework for many contemporary web applications, enabling client-side interaction and HTML element manipulation. JavaScript is used to build logic, handle events, request APIs, and carry out different front-end activities. To build dynamic and responsive user interfaces for the crowdfunding platform, JavaScript is frequently combined with React.

3. React 18.2.0:

ReactJs is a well-liked JavaScript library for creating user interfaces. When the underlying data changes, it enables developers to quickly update the user interface (UI) with reusable UI components. React has a component-based architecture, which makes managing intricate user interfaces simpler. It offers a robust ecosystem of tools and frameworks for frontend development and uses a virtual DOM for effective rendering.

4. Tailwind CSS 3.2.4:

A CSS framework with a focus on utility, Tailwind CSS offers a library of pre-built CSS classes for web page styling. It concentrates on offering basic utility classes that may be combined to produce unique designs without writing new CSS. With the responsive and adaptable design system provided by Tailwind CSS, developers can quickly create aesthetically pleasing interfaces.

5. Node.js 18.7.0:

Using Node.js, developers may run JavaScript code on the server-side. Node.js is a JavaScript runtime environment. It is incredibly effective at enabling the development of scalable and fast web applications because it offers an event-driven, non-blocking I/O strategy. The Node Package Manager (npm) makes a huge ecosystem of Node.js modules and libraries accessible, allowing developers to incorporate a variety of features in their applications.

6. Express.js 4.18.0:

Express.js is a straightforward Node.js web application framework. It offers a straightforward and understandable solution to create web servers and APIs. For managing HTTP requests and responses, routing, and error handling, Express.js provides middleware capabilities. It enables programmers to create robust backend logic by defining routes and handling various HTTP methods.

7. Ethers 5.7.2:

The Ethereum blockchain may be easily accessed with the help of this JavaScript library. It offers a more advanced API for building wallets, authorising payments, and engaging with smart contracts. Developers can concentrate on creating Ethereum-powered applications without having to worry about the technical specifics thanks to Ethers, which abstracts away the complexities of Ethereum's low-level protocols.



8. Thirdweb 3:

The Ethereum blockchain may easily be used to deploy smart contracts using the Thirdweb 3 framework. It offers utilities and tools for developing, deploying, and testing smart contracts. For developers using Ethereum smart contracts, Thirdweb 3 offers a streamlined workflow and streamlines the deployment process.

9. MySQL 8.0:

Popular for storing and managing structured data, MySQL is an open-source relational database management system (RDBMS). With support for ACID (Atomicity, Consistency, Isolation, Durability) qualities, it offers a scalable and dependable database solution. For managing databases, carrying out CRUD (Create, Read, Update, Delete) activities, and carrying out sophisticated queries, MySQL employs SQL (Structured Query Language).

IV. EXPERIMENTAL RESULT

Architecture Diagram

Users of the crowdfunding application visit the website through their MetaMask wallet, which serves as a link between their browser and the Ethereum blockchain. Users can interact with the platform thanks to the frontend, which was created with React and Thirdweb SDK. To acquire and store data in the SQL database, HTTPS requests are made from the frontend to the backend server, which is powered by Express.js and Node.js. For the purpose of carrying out smart contracts on the Ethereum blockchain, JSON-RPC queries are sent to the Thirdweb Provider. Through the Thirdweb Provider, this architecture enables smart contract execution, safe transactions through MetaMask, front-end development with React, back-end processing with Express.js, data management with SQL, and seamless user interaction.

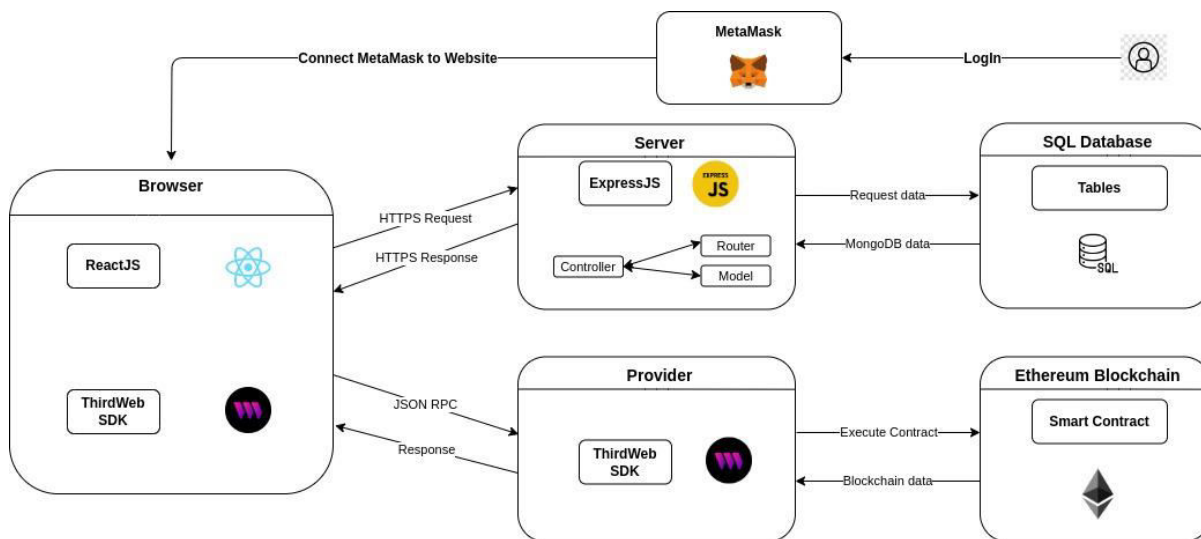


Figure 1: Architecture Diagram

Use case Diagram

The campaign creator can create a new campaign by including all relevant information, such as the campaign title, description, and financial target, among other things. In order to interact and communicate with potential donors, they can also leave comments on the campaigns they themselves have launched. Additionally, the person running the campaign can make polls to get community input or thoughts and to update funders on how the campaign is doing. Donor can browse through various campaigns, check a campaign's information to learn about its goals and intended audience, and donate to a campaign using Ethereum (ETH) to help it reach its financing target. Donors can show their support by liking campaigns and posting comments. Donors can also participate in polling activities to express their preferences or thoughts on particular campaign-related issues.

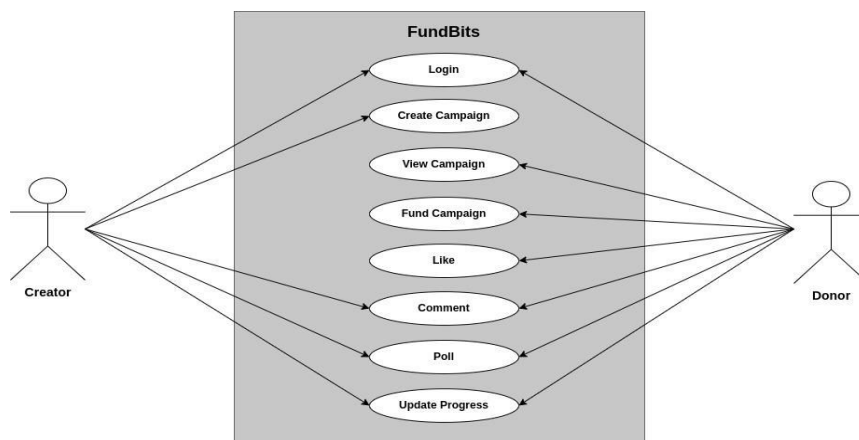


Figure 2: Use case diagram

Activity Diagram

The user's login to the website marks the beginning of the activity diagram. The user must register by giving the necessary information if they are a new user. The user is brought to the home page after registering or if they are already a user. The user has a variety of options on the home page. They can go through the campaigns that are already available, delve into the details of an existing campaign, start a new campaign, or filter campaigns made by the current user. When a user clicks on a particular campaign, information about its goal, status, and donation options are provided in the campaign details. The user then has the option to give to the cause, like it, provide comments, or take part in campaign-related surveys.

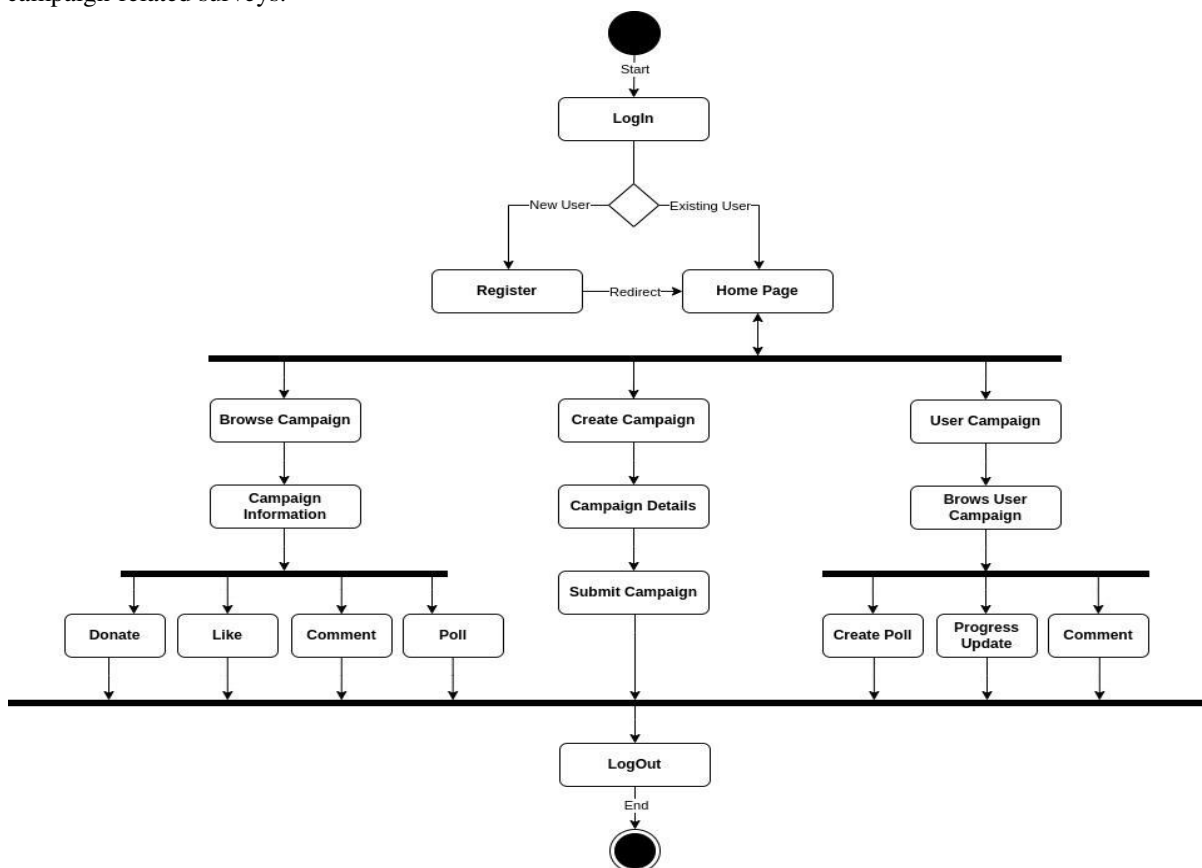


Figure 3: Activity Diagram

The user is requested to submit the necessary information while starting a new campaign, including the campaign's name, description, financing target, and other pertinent elements. The campaign is processed and recorded on the blockchain after the user submits it, guaranteeing transparency and immutability.

As a whole, the architecture, use case diagram, and activity diagram of the crowdfunding platform describe the main features of its layout and operation. The platform can offer a seamless user experience thanks to the integration of several technologies, including React, Solidity, Node.js, and MySQL, as shown in the architecture diagram. Secure data retrieval and storage are ensured by using a MetaMask wallet connection and HTTPS requests to communicate with the server running Express on Node.js. The use case diagram demonstrates the options open to various user roles, such as donors and campaign producers, allowing users to manage campaigns, interact with campaign information, and participate in polls and comments. The platform's activity flow is depicted in the activity diagram, which directs users from login or registration to carrying out different actions including browsing campaigns, establishing new campaigns, and interacting with campaign information. Together, these illustrations show how the platform can support crowdfunding campaigns while providing a simple user experience. The use case diagram highlights important user interactions, the activity diagram details the user's step-by-step procedure, and the architecture provides seamless technology integration.

V. CONCLUSION

In conclusion, a crowdfunding application that incorporates Web 2.0 and Web 3.0 technologies has a lot of advantages for both project creators and backers. The crowdfunding platform is made more dynamic, interesting, and safe by fusing the user-centered, collaborative elements of Web 2.0 with the decentralised infrastructure and security characteristics of Web 3.0. A feeling of community is fostered and user engagement is increased by the inclusion of social interaction components including project sharing, user profiles, and comment areas. Decentralised financing systems, smart contracts, and blockchain technology all contribute to Web 3.0's guarantee of transparent transactions, improved security, and decreased reliance on middlemen. The crowdfunding sector could undergo a transformation thanks to the convergence of Web 2.0 and Web 3.0, which would also foster collaboration, innovation, and secure financial transactions in a lively and secure environment.

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