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DAAPFUND –A FRACTIONAL OWNERSHIP PLATFORM

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Abstract — Blockchain, a decentralized open digital ledger, revolutionizes crowdfunding by eliminating intermediaries. Transactions recorded across computers remain unchangeable, ensuring consensus. Decentralization empowers projects, circumventing the need for external platforms, and enabling flexible fundraising. Rules are superseded, allowing any interested project to secure funding. Equity gains prominence, facilitated by blockchain's Asset Tokenization, offering ownership stakes to investors. Funding new ventures and granting ownership stakes becomes feasible. Internet connectivity empowers global participation, expanding funding opportunities. Blockchain's impact on crowdfunding is transformative, fostering autonomy, inclusivity, and innovative ownership models.

Keywords — Blockchain, Crowdfunding, Fundraising, Decentralization.

I. INTRODUCTION

Our project proposal targets modest ventures and small companies with the ability to produce high-quality goods. Our suggestion is especially pertinent when projects lack finance knowledge and haven't gotten investments. We have developed a multi-investor auction system that is suitable for such circumstances. Before making an investment choice, potential investors can review project information, including the title and abstract. Our strategy seeks to close the funding gap for worthwhile initiatives and simplify the procedure for both entrepreneurs and investors.

The 1990s are when the idea of distributed computing first emerged. Distributed computing is a branch of computer science that focuses on the study of distributed systems, where coordination is achieved by message exchanges across linked computers. Maintaining component concurrency, overcoming the lack of a global clock, and successfully handling component failures without leading to a systemic collapse are inherent issues faced by distributed systems. Using distributed systems to solve computational issues is also a part of distributed computing. In this situation, duties are divided into several jobs that are carried out by various computers while they communicate through message passing. Satoshi Nakamoto is credited with creating Bitcoin, which marked a key turning point in 2009. The foundation for Bitcoin was built by Nakamoto's 2008 White Paper, for which he also directly created and launched the original reference implementation. The creation of the Bitcoin code began in 2007, and in August 2008, Nakamoto acquired the domain name bitcoin.org. On October 31, through the cryptography mailing group, a white paper titled "Bitcoin: A Peer-to-Peer Electronic Cash System" was made public. On January 9, 2009, Nakamoto released version 0.1 of the Bitcoin software on SourceForge along with a prize of 50 bitcoins, marking the creation of the network. The years 2011 and 2012 saw the continued development of cryptocurrencies, with an emphasis on their use as a form of money.

Matic Network uses side chains as its scalability solution. These side chains are connected to the Ethereum blockchain but operate as separate blockchains processing transactions. This reduces the load on the Ethereum network and speeds up transactions. Matic Network utilizes the Plasma framework to secure transactions. Plasma is a layer 2 scaling solution that maintains security while enabling fast transactions. Matic Network employs the PoS consensus mechanism, which is efficient and scalable. Validators verify transactions and earn tokens as rewards.Matic Network regularly creates checkpoints on the Ethereum blockchain, ensuring the security and integrity of the sidechain. Matic Network integrates with wallets, allowing users to easily transfer and store Matic tokens in their wallets.

The Ethereum Virtual Machine (EVM) functions as a digital infrastructure that executes transactions similarly to how machines would. To deploy smart contracts, Integrated Development Environments (IDEs), which are similar to truffle tools, are required. Smart contracts generally use non-fungible tokens (NFTs) to produce and administer original works of art. Nodes are the building blocks of a blockchain infrastructure, which consists of many interconnected nodes.

II. LITERATURE SURVEY

The paper "Regulatory Opportunities and Challenges for Blockchain Adoption for Circular Economies" by K. Steenmans, P. Taylor, and I. Steenmans, presented at the 2021 IEEE International Conference on Blockchain, discusses the nascent relationship between blockchain technology and circular economies. The essay examines the possible influence of blockchain on the advancement of circular economy laws and regulations in light of the few available research. The paper makes a contribution to this developing topic by examining the potential outcomes and challenges of using blockchain technology in circular economy practices. The essay concentrates on many important issues: The present function of blockchain within the legal framework of circular economies, The regulatory barriers preventing the use of blockchain in circular economies, and The opportunity for regulatory improvements to harness the potential of blockchain for promoting circularity. The report provides early insights into this developing nexus of technology and sustainability using a mixed methodologies approach comprising empirical and doctrinal research. [I]

Blockchain Mining Pools" presented at the 2019 Crypto Valley Conference on Blockchain Technology focuses on strengthening the security of blockchain mining pools. In order to combat miner-based attacks like block withholding (BWH) and forking after withholding (FAW), which make use of flaws in the dynamics of mining pools to get unfair rewards, it adds the Anti-Withholding Reward System (AWRS). By encouraging miners to constantly submit blocks, especially when coupled with pool administrators, AWRS hopes to deter such assaults. By lowering costs and maintaining backward compatibility, this strategy discourages FAW assaults and promotes ethical mining practices. By strengthening the integrity of blockchain mining pools and lessening the effects of malicious activity, AWRS encourages a safer and more logical mining environment. [II]

A paper by Y. Cheng and H. Shaoqin titled "Research on Blockchain Technology in Cryptographic Exploration" that was presented at the 2020 International Conference on Big Data Artificial Intelligence Software Engineering (ICBASE) explores the use of blockchain technology for enhancing security in smart factories moving towards Industry 4.0. Traditional network security solutions become insufficient as factories transform into smart facilities, needing creative strategies. The study suggests merging blockchain technology with basic IoT radio frequency identification (RFID) technology to solve concerns like information leakage and unauthorized data access in cryptographic production settings within smart factories. The study presents a lightweight yet secure access to industrial data authentication technique for smart factory RFID systems based on blockchain. It addresses security issues such as server spoofing, replay assaults, and man-in-the-middle attacks while offering fresh perspectives on data security in the context of smart factories. [III]

The 2019 IEEE International Conference on Blockchain (Blockchain) paper "A Hybrid Blockchain Architecture for Privacy-Enabled and Accountable Auctions" by H. Desai, M. Kantarcioglu, and L. Kagal examines the role of blockchain in decentralized applications, highlighting both its potential and limitations. While several cryptocurrencies have been enabled by public blockchains, they may jeopardize critical data. Although research into advanced cryptography continues, fixing these issues sometimes necessitates resource-intensive changes to already-existing blockchains like Ethereum. The report suggests private blockchains as a remedy in response. These blockchains handle privacy issues by limiting sensitive data accessibility to select groups, enabling effective and privacy-preserving data sharing among pre-authorized parties. In order to enable improved and safe decentralized procedures, the study offers a hybrid blockchain architecture that strikes a balance between decentralization, privacy, responsibility for applications like auctions. [IV]

The paper "Blockchain Applications in Various Sectors Beyond: Bitcoin" by B. Kakkar, P. Johri, and A. Kumar, which was presented at the 2021 International Conference on Advance Computing and Innovative Technologies in Engineering (ICACITE), examines the various uses of blockchain technology outside of its connection to Bitcoin. Without a single centralized authority, a blockchain serves as an open and decentralized mechanism for storing records. With the help of this technology, people and organizations may collaborate in dependable ways, creating solid connections. Blockchain has potential across businesses and provides a competitive edge. It was first known for its function in Bitcoin. The research focuses on the revolutionary effects of blockchain technology on industries outside of Bitcoin. It particularly improves healthcare applications by enabling mobile device integration, equipment monitoring, safe storage of electronic medical records, clinical trial data, and The report emphasizes how commonplace blockchain applications are across several fields and emphasizes how they have the potential to empower numerous industries. The report is a thorough resource that offers knowledge on current research, practical applications, and the overall potential of blockchain technology. [V]

III. METHODOLOGY

Projects using blockchain technology to raise money frequently need the gathering of data from several sources. An outline of the basic process for gathering data for such initiatives is provided below.

This might entail checking the legitimacy of project team members, ensuring that the project's objectives are realistic, and making sure the project is in line with financial needs. Release of money: After the project data has been checked and approved, the project team may get the funds. Funds might be released in phases when project milestones are reached.

The data gathered is tracked and reported on throughout the study. This guarantees that the project is moving along as intended and that any problems or obstacles are found and dealt with as soon as possible. Data gathering is a significant and continuing activity for blockchain-based funding ventures. It enables project teams to monitor progress and make data-driven choices while also assisting in ensuring openness and accountability.

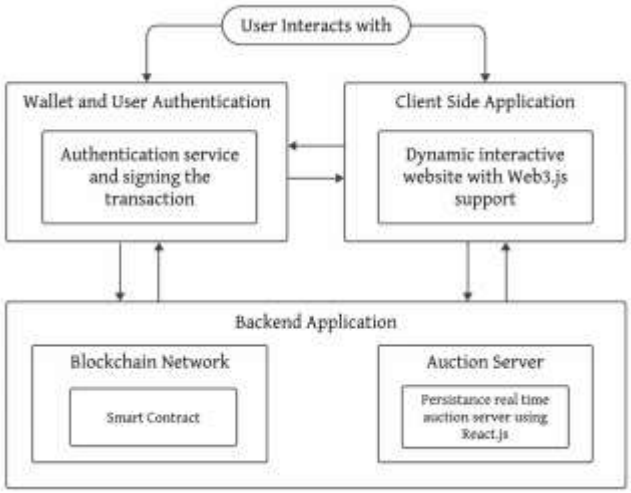

Fig 1: System Architecture

System Architecture: The System architecture (Fig 1) of our project includes a React-based front-end application integrated with the Web3.js library for blockchain interaction. Users' identities are verified by Ethereum's popular MetaMask wallet, providing secure access to the platform. Once verified, users can easily complete transactions on the Polygon blockchain through smart contracts sent to ownership and token transactions. Users can invest in various projects by purchasing an equity stake, and ownership is securely locked on the blockchain. A separate site also manages the bidding process, allowing users to bid on available projects. The bidding process is efficient and geared to the highest level of competition; Transparency and justice are ensured in the fair distribution of funds. The project provides a safe and fair platform for investment and competition by using blockchain technology to provide security and transparency while improving user experience and accessibility.

ReactJS Framework: ReactJS is a well-known JavaScript library for creating user interfaces, and it may be used as a framework to create a decentralized marketplace where users can place bitcoin bids on goods up for sale. ReactJS may be a reasonable choice for this kind of platform for the following reasons: ReactJS is built on a component-based design, which makes it simple to create and reuse sophisticated user interfaces.

Integration with other tools: Redux for state management and Web3 for communicating with the Ethereum blockchain are two examples of additional tools and libraries that ReactJS can be readily connected with. This might be helpful for developing a decentralized bidding platform that incorporates smart contracts and Bitcoin wallets. Overall, ReactJS may be an effective foundation for creating a decentralized platform that enables users to place Bitcoin bids on products for sale. It is ideally suited for creating intricate and scalable user interfaces due to its component-based architecture, virtual DOM, server-side rendering, and sizable development community.

MetaMask is a cryptocurrency wallet and decentralized application (DAPP) browser extension that allows users to manage their Ethereum-based assets and interact with Ethereum-based DApps directly from their web browsers.In our research we use metamask wallet for the login purpose and the from the matamask the investor can do payment by using their wallet.

Web3.js (short for "web3 integration") is a JavaScript framework that interacts with the Ethereum blockchain, which serves as the foundation for many decentralized platforms, including those that let users place cryptocurrency bids on goods up for sale. It might be used in the platform's backend to interact with the Ethereum blockchain and allow features like accepting cryptocurrencies for purchases and sales. Following are some justifications as to why Web3.js could be a wise decision for this kind of platform: Integration of Ethereum: The Ethereum blockchain, the most popular blockchain for decentralized applications, is particularly intended for interaction with Web3.js.

Polygon blockchain can serve several important purposes depending on the specific requirements and objectivesIn our project we use polygon blockchain for the deployment of our project because the Polygon's side chains enable faster and cheaper transactions compared to the Ethereum mainnet. This can be particularly beneficial for projects that involve frequent microtransactions, such as gaming or decentralized finance (DeFi) applications. Lower transaction costs make it more feasible to build and operate DApps that rely on a large number of transactions.

We use polygon because in our website the user traffic is more because there are two types of users are investor and inventor so that polygon support enhances the overall user experience of a project by reducing latency and improving responsiveness. Users of DAPP built on Polygon experience faster confirmation times for transactions and lower gas fees, leading to a smoother and more seamless interaction with the application.

Matic Network uses a Proof of Stake (PoS) consensus mechanism to secure its sidechains and achieve consensus among network participants. Validators stake their tokens as collateral to participate in the consensus process and are responsible for validating transactions and creating new blocks. PoS consensus ensures the security and integrity of Matic Network's side chains while enabling fast and efficient transaction processing. It is the polygon layer two so it also support to make the website user friendly and the make website effective with the low cost

Hardhat is a development environment and task runner for Ethereum smart contract development. It provides a wide range of tools and features to simplify the process of writing, testing, and deploying smart contracts on the Ethereum blockchain. Hardhat is commonly used for local development and testing of Ethereum smart contracts before deploying them to the mainnet or other Ethereum networks. In our research we use this tool for the testing purpose like we use it for the check the ethereum code and the smart contract of the blockchain this tool help to easily optimize the blockchain code

Hardhat provides a built-in local blockchain network called Hardhat Network, which you can use for local development and testing purposes. Hardhat Network allows you to deploy and interact with smart contracts in a local Ethereum environment without incurring any gas costs.

The blockchain provides a visible and unalterable record of all bids and transactions, ensuring transparency in the bidding process. User confirmation and authentication: Before enabling users to participate in the auction, the auction platform must make sure that they are all confirmed and authenticatedTesting and security: The auction platform must go through rigorous testing to ensure that it functions correctly and is secure against hackers or other threats. Respect for legal requirements: Depending on the nation in which the auction is placed, respect for legal obligations, such as, Smart contracts are self-executing contracts with the terms of the agreement directly written into code. In our research we use solidity for the written of the code because

solidity allows to make the blockchain contact all our project transaction contract is return on the solidity because the code like ethereum is also return on the solidity so that it is very efficiency Solidity is a contract-oriented programming language, meaning that it is primarily used for defining and deploying smart contracts on blockchain platforms. Developers use Solidity to define the state variables, functions, and events that comprise a smart contract, as well as the rules for executing transactions and interacting with other contracts.

Deployment: In our project, we use Hardhat to serve smart contracts on the Polygon blockchain. The process involves setting up the Hardhat project with appropriate network settings for the Polygon Mumbai testnet, writing and documenting the smart contract in the project directory, and then deploying it using the export script or plugin provided by Hardhat. Finally, we use Hardhat's testing framework to test the performance of the smart contract used to ensure its reliability and performance on the Polygon Mumbai testnet. To get free MATIC tokens for testing purposes, we use the Matic Faucet website specially designed for Polygon Mumbai Testnet. The process involves visiting the Matic Faucet website and providing a wallet address that will send free Matic tokens. To prevent abuse, a certain number of Matic tokens will be issued to the appropriate wallet for free after completing the CAPTCHA verification process, submitting the application and being approved. These tokens can be used to facilitate testing of smart contracts and other equity applications on Polygon's Mumbai testnet, allowing developers to test and validate projects without paying ghost fees. Polygon's scalability and cost efficiency make it an excellent choice for deploying smart contracts and building decentralized applications, especially for projects focused on cost optimization and scalability. Polygon's layer 2 scaling solution provides lower fees and faster confirmation times compared to Ethereum, making it ideal for testing and implementing smart contracts without high fuel costs.

Cryptocurrency support: The platform should support a range of cryptocurrencies for bidding and payment, including popular options like Bitcoin, Ethereum, and Litecoin, as well as stablecoins like Tether or USDC.

Transaction fees: The platform may charge transaction fees for placing bids, transferring cryptocurrency, and other actions. These fees may be fixed or variable, de47 depending on the platform's business model. The platform's user interface should be intuitive, user-friendly, and responsive, allowing users to place bids and manage their accounts with ease.

Performance metrics: The platform's performance metrics may include transaction processing speed, uptime, scalability, and other key indicators of reliability and efficiency.

Security and privacy features: The platform should have robust security and privacy features, including SSL encryption, two-factor authentication, and anti-fraud measures, to protect users' cryptocurrency and personal information The auction platform should allow users to view a list of items for sale, along with relevant information such as starting price, bid increment, and bidding period.

Bid submission: Users should be able to submit their bids easily, with clear instructions on how to do so. The platform should allow users to specify the amount of their bid and confirm their bid before submission.

Bid tracking: The platform should provide users with real-time updates on the bidding process, including current bid amounts and the remaining time in the bidding period.

Payment processing: The platform should allow users to make payments using cryptocurrency and provide clear instructions on how to do so. The platform should also provide confirmation of successful payments and any necessary transaction details.

Auction process Registration: Participants register for the online auction by providing necessary information.

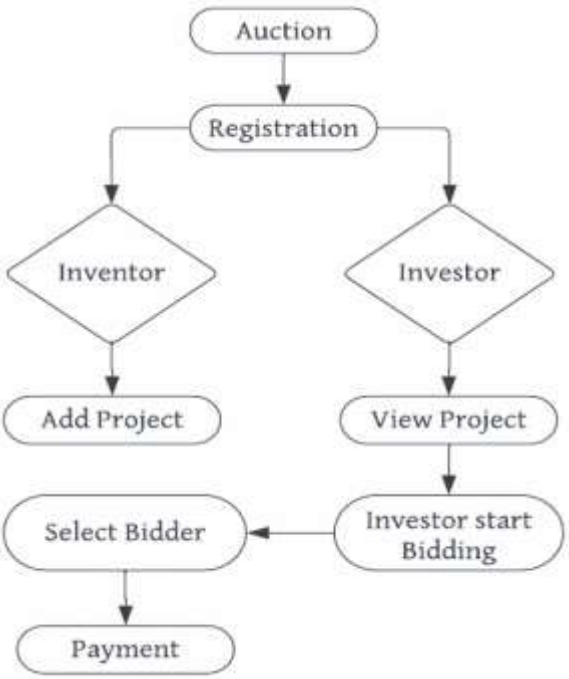

Fig. 2 Auction Flowchart

Bidding: Participants place their bids on the items being auctioned.

New Bid: After each bid, the system checks if there are any new bids.

Auction Ends: The system checks if the auction has reached its end time or if there are no new bids for a certain period.

Item Sold to Highest Bidder: If the auction has ended, the item is sold to the highest bidder.

Payment: The winning bidder makes the payment according to the auction terms.

Equity transfer: Upon receiving payment, this project equity is transferred to the bidder. And the auction process concludes.

IV. SYSTEM DESIGN & IMPLEMENTATION

User / Inventor: Users or inventors can add their projects to the platform by submitting project details and relevant documentation through the user interface. Once submitted, this information is recorded on the blockchain network, ensuring transparency, immutability, and accessibility to all platform participants.

Investor: Interested investors on the platform can browse and view projects listed by inventors. Each project will have detailed information provided by the inventor, including project descriptions, funding goals, timelines, and any other relevant details. Additionally, investors can view the terms of the smart contract associated with each project.

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Smart Contracts: Smart contracts serve as the backbone of this process. It automates key functions such as fund collection, and ownership tokenization and also ensures the execution within the predefined rules and conditions.

Ownership Tokenization: The smart contracts mint digital tokens representing ownership stakes in the project and distribute them to the investors based on their contributions. These tokens are recorded on the blockchain, providing investors with proof of ownership and transferability.

Auctions: Inventors initiate project auctions by specifying auction parameters such as starting bids and durations, Investors participate in auctions by placing bids on projects they are interested in. Bids are recorded on the blockchain and can be viewed by all the participants. Once the auction is completed the smart contract executes the transfer of funds and ownership tokens according to the auction terms.

Metamask Integration: Investors can connect their Metamask wallet to the auction platform, allowing them to pledge funds, receive funds, and receive ownership tokens seamlessly. Here, the meta mask serves as the bridge between the auction platform and the blockchain allowing investors to manage their accounts, view token balances, and initiate transactions.

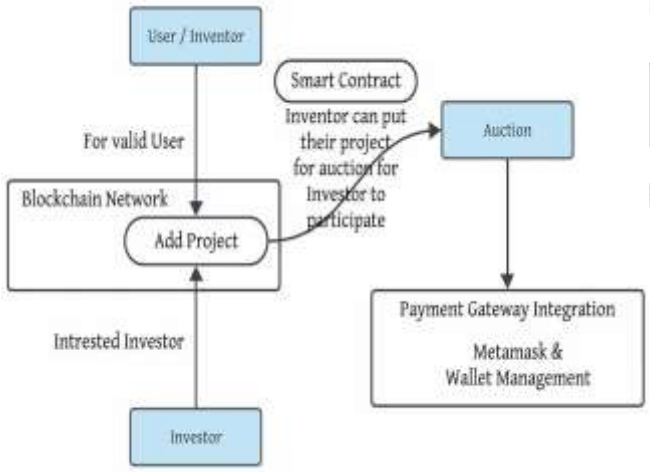

Fig 3: System Design

Specific Requirements:

1. **UserAuthentication and Wallet Interaction:**
   a. Integration with a secure authentication service to ensure user identity verification and session management.
   b. Implementation of wallet interaction features using Web3 libraries to enable users to connect their wallets securely and sign transactions.
   c. Support for various wallet types (e.g., MetaMask, Trust Wallet) to accommodate different user preferences and enhance accessibility.
   d. Implementation of security measures such as multi-factor authentication (MFA) to safeguard user accounts and transactions.
2. **Client-Side Application:**
   a. Development of a responsive and user-friendly client-side application using modern web technologies to ensure a seamless user experience.
   b. Integration of Web3 or similar libraries to enable direct interaction with the blockchain network and smart contracts from the client-side application.
   c. Implementation of dynamic features such as real-time updates, notifications, and interactive elements to enhance user engagement and satisfaction.
   d. Compatibility with various web browsers and devices to ensure accessibility for a wide range of users.
3. **Blockchain Network and Smart Contracts:**
   a. Integration with a blockchain network to deploy smart contracts and execute transactions securely and transparently.
   b. Development and deployment of smart contracts using tools like Solidity and Truffle to implement crowdfunding, ownership tokenization, and auction functionalities.
   c. Testing of smart contracts using frameworks like Hardhat or Truffle to ensure functionality, security, and compliance with business requirements.
   d. Implementation of mechanisms for interacting with smart contracts, such as contract abstractions and event listeners, to facilitate communication with the backend application and client-side application.

External Interface Requirements:

1. **Authentication Service:**
   a. APIs for user registration, login, logout, and password reset functionality.
   b. Integration with third-party identity providers for social login options.
   c. Support for authentication protocols such as OAuth 2.0 and OpenID Connect for secure authentication and authorization.
2. **Wallet Integration:**
   a. APIs for connecting user wallets to the platform and securely.
   b. Integration with wallet SDKs and libraries (e.g., Web3.js, ethers.js) for seamless interaction with the blockchain network and smart contracts.
3. **Client-Side Application APIs:**
   a. APIs for retrieving project listings, details, and auction information from the application.
   b. Endpoints for submitting auction bids, managing user profiles, and processing transactions.
   c. Support for real-time updates and notifications using WebSocket or Server-Sent Events (SSE) protocols.

4. **Blockchain Network APIs:**

   a. APIs for deploying smart contracts, executing transactions, and querying blockchain data.

   b. Integration with blockchain infrastructure providers (e.g., Alchemy, Infura) for reliable access to blockchain networks and test environments.

   c. Support for token standards (e.g., ERC-20, ERC-721) and token-related operations such as transfer, approval, and balance retrieval.

V. RESULT &ANALYSIS

The integration of blockchain technology into the joint venture is revolutionizing the world of traditional fundraising and offering unparalleled efficiency, effectiveness and engagement. Through our project, we are demonstrating the potential of blockchain to transform the crowd by eliminating the middleman and enabling direct peer-to-peer transactions. Leveraging the Polygon blockchain for security and zero transaction fees and MetaMask for user authentication, we have created a powerful and decentralized platform for project investment and bidding.One of the key features of our system architecture is the use of smart contracts used on the Polygon blockchain to manage project ownership and token transactions. This increases participants' trust by ensuring that no changes are made and members' stakes are transparent. Additionally, the integration of the Web3.js library with the React front-end can interact with the blockchain, providing users with a user-friendly and intuitive experience.

The successful auction in our project further increases the crowd by allowing users to participate in the auction project. The competition process is transparent and effective; Highest bidders receive membership after the contest is completed. This process promotes competition and ensures the fair property value of the project. Also, our project uses tokenization to prove assets on behalf of the owner. Tokenization makes ownership a part of the asset, providing the product with proof of ownership, transaction security and transparency. By tokenizing equity capital, we support different investment types and enable investors to access different investment opportunities.

Our project demonstrates the evolution of blockchain in the field of crowdsourcing by sending smart contracts and using the transparent competition of the Polygon blockchain. Adopting blockchain technology not only increases the efficiency and transparency of the crowdfunding process, but also provides free access to investment resources and promotes independence and togetherness. Looking to the future, the continued development and improvement of blockchain-based crowdfunding platforms has the potential to transform traditional fundraising models and open new avenues for innovation and technology. Our project demonstrates the transformative power of blockchain to the crowd and provides insight into the future of financial management and investment. By leveraging the power of blockchain technology, we have created a transparent, efficient and inclusive investment and competition platform, paving the way for the fair and profitable use of funds.

METRIC	CENTRALIZED	DECENTRALIZED
Control	1	5
Accesibility	2	5
Transparency	2	5
Fees	4	1
Innovation	3	5

Fig. 4 Result Matric

Each metric is rated on a scale of 1 to 5, with 1 being the lowest and 5 being the highest (Fig. 4). You can interpret these ratings as follows:

Control: Centralized funding has low control (1), while decentralized funding offers high control (5). Accessibility: Centralized funding has limited accessibility (2), whereas decentralized funding provides global accessibility (5). Transparency: Centralized funding lacks transparency (2), while decentralized funding offers high transparency (5).

Our project offers a pioneering decentralized crowdfunding approach, characterized by the new integration of asset tokenization and a competitive bidding system. By tokenizing ownership, we enable investors to gain the most equity, investment freedom and market development in high-value assets. Implementing a transparent competition further encourages competition and ensures fair value of the integrity of the project, fosters a positive environment and includes the crowd. Leveraging the scalability and cost-effectiveness of the Polygon blockchain, our platform provides users worldwide with seamless access to crowdfunding opportunities at the lowest cost. Additionally, our commitment to security and transparency through immutable smart contracts increases trust and confidence in the crowdfunding process. The results of our work include increasing access to capital resources, improving business performance and promoting innovation in the financial sector. Overall, our project is at the forefront of the crowdfunding revolution by leveraging blockchain technology to create a transparent, efficient and inclusive fundraising ecosystem.

VI. CONCLUSION

The outcomes and conclusions of a blockchain-based auction may be assessed based on a number of criteria, including security, transparency, effectiveness, and user experience.

Here are some possible outcomes and deductions: Security: The great degree of security that blockchain technology offers is one of the main advantages of employing it in an auction. By using smart contracts, the auction is performed in a transparent and impenetrable manner, which can lower the risk of fraud and increase buyer and seller confidence.

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