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Blockchain Based Distributed Fundraising Platform

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Abstract: ***This research paper examines blockchain technology's reframing capabilities in fundraising, with a pivot to using Internet Computer as a decentralized platform. By comparing various blockchain networks such as Ethereum, Bitcoin, and Hyperledger, while examining the main characteristics of blockchain, this paper illuminates the advantages and challenges of each network in the realm of fundraising. Traditional fundraising platforms are collated with blockchain-based alternatives, emphasizing the benefits of security, transparency and efficiency awarded by blockchain technology. Moreover, this paper presents a feature to improve transparency and confidence within blockchain-based fundraising platforms: the ability for charities to upload government-issued tax exemption certificates. These certificates, when uploaded, will be accessible to all platform users, delivering supportable evidence of the charitable status of partaking organisations. This feature seeks to infuse trust among donors and encourage informed decision-making while promoting accountability and integrity within the fundraising ecosystem. Via a thorough study of blockchain technology, relative platform evaluations, and the introduction of ingenious features, this research donates to extending our understanding of the possible impact of blockchain on fundraising approaches and highlights the significance of transparency and trust in charitable efforts.***
Keywords: Ethereum, Transparency, Hyperledger, Internet-computer, certificates

I. INTRODUCTION

In recent years, blockchain technology has arisen as a disruptive power across different industries, delivering transparency, security, and efficiency in practices previously troubled by inefficiencies and absence of accountability. One such domain grown for transformation is fundraising for NGOs and charitable organizations. Traditional fundraising platforms usually face issues such as high transaction costs, lack of transparency in fund distribution, and restricted accessibility to information for donors, including tax exemption certificates. This paper delves into the development and comparison of a blockchain-based fundraising platform aiming to address these limitations. The application explores the capabilities of two renowned blockchain systems: Ethereum and Internet Computer. Ethereum, with its robust smart contract functionality and expansive adoption, stands as a frontiersperson in blockchain-based platforms, while Internet Computer, with its commitment to infinite scalability and interoperability, offers an intriguing alternative. The primary objective of this paper is to assess the practicality of Ethereum and Internet Computer blockchains for hosting a fundraising platform tailored to the needs of NGOs and donors. Further, it strives to deliver an exhaustive comparison of various blockchain platforms, including their performance metrics, security features, scalability, and ease of development. One of the essential elements of the suggested fundraising platform is its transparency and accountability mechanisms. Donors will have the capability to view the tax exemption credentials of NGOs presently on the blockchain, providing trust and confidence in the donation procedure. This feature not only improves transparency but also simplifies the validation process for organizations, eradicating the need for mediators and lowering associated costs. Similarly, this paper embarks on a relative study between traditional fundraising sites and blockchain-based applications. By analysing factors like transaction costs, security, speed of transactions, and transparency, it aims to underline the benefits of embracing blockchain technology in the fundraising domain. In summary, this paper strives to contribute to the growing body of literature on blockchain applications in the nonprofit sector by suggesting a fundraising platform that harnesses the possibilities of Ethereum and Internet Computer blockchains. Via a comprehensive comparative study and evaluation of performance metrics, it aims to deliver insights into the transformative effect of blockchain technology on the fundraising terrain, paving the way for additionally efficient, transparent, and inclusive fundraising approaches. An exhaustive comparison of various blockchain platforms, including their performance metrics, scalability, security features, and ease of development. The decentralized application built on the Ethereum blockchain ensures that all information related to campaigns, contributions, and transactions is stored on a secure and decentralized network, visible to all users.

II. LITERATURE SURVEY

Any research project starts with an understanding of the body of current knowledge and the identification of areas that could use innovation or improvement. In order to evaluate the present situation of blockchain-based platforms for charitable fundraising, we conducted a thorough examination of research papers in this review of the literature. Through a critical evaluation of the literature, we hope to point out the shortcomings of the status quo and clarify how our ideas are superior to it.

A. Nazmus Saadat's Blockchain-based Crowdfunding Systems:

A blockchain-based crowdfunding system was unveiled by Md. Nazmus Saadat. Funds are distributed to fundraisers in accordance with investor voting approval. Campaigns are started by fundraisers, and investors contribute to them. Additionally, by making requests, fundraisers can specify how the money they have raised will be used. The approval of the expenses is then decided by a vote among donors who either support or oppose these requests. A smart contract facilitates the transfer of funds to vendors in the form of ether when a request is approved by the majority of supporters. The ether transactions between vendors, investors, and fundraisers are overseen by this smart contract. The system is connected to the Ethereum network and verifies user transactions using the Rinkeby network, a proof-of-authority blockchain. It is necessary to address challenges like the reliance on voter participation, the subjective decision-making process through investor voting, the complexity of smart contract execution, and scalability issues with Ethereum integration. To get around these restrictions, scalability solutions exploration, transparent decision criteria, comprehensive smart contract audits, and participation incentives are essential for improving the platform's efficiency and reliability.

B. Firmansyah Ashari's Smart Contract and Blockchain Crowdfunding Platform:

The COVID-19 pandemic has led to an increase in fundraising efforts, which has highlighted the importance of trust in crowdfunding operations. Smart contracts and blockchain technology are emerging as technical tools that can strengthen accountability and transparency in these procedures. Funders' confidence in the integrity of fundraising activities is ensured by blockchain, which allows immutable and transparent transaction records through the use of cryptographic hashing and decentralised consensus mechanisms. Smart contracts reduce the risk of fraud and misallocation by enabling safe and verifiable fund disbursement through automatic execution upon the fulfilment of predetermined conditions. This research explores the complex interactions between these technologies and popular models of crowdfunding, highlighting how they can increase stakeholder trust, especially in the non-profit sector. Fundraising platforms may give donors more assurance about the dependability of their contributions and the legitimacy of beneficiaries by utilising blockchain's decentralised validation and smart contract automation. Simplifying user interfaces, putting scaling solutions in place, improving error correction mechanisms, and bolstering security measures are all necessary to address blockchain's limitations in crowdfunding. In addition, encouraging regulatory discourse can guarantee compliance while offering a favourable atmosphere for innovation.

C. Shrishti Varshney's Crowd Gain: An Ethereum-based blockchain-based crowdfunding web application:

The implementation of smart contracts on platforms such as Ethereum offers an automated campaign management framework in the context of blockchain-based crowdfunding. The conditions for releasing funds to project creators, fundraising goals, and project details are all encoded in these smart contracts, along with other parameters and rules that govern the crowdfunding process. Participants conduct transactions with ease using the popular browser extension MetaMask. During campaign setup, creators pay gas fees, and investors donate money to campaigns. Donation processes are streamlined by the MetaMask interface, guaranteeing quick, safe transactions that usually take 15 to 20 seconds to complete. Donor contributions are accurately recorded upon confirmation, ensuring accountability and transparency throughout the fundraising project. When a campaign is successful, money is automatically distributed to the creators, enabling them to continue working on their projects. On the other hand, smart contracts enable automatic refunds to donors in cases where fundraising targets are not fulfilled by the deadline, enhancing the honesty and equity of the crowdfunding process. This comprehensive strategy highlights how blockchain technology can revolutionize community-driven projects and democratize access to capital.

The main drawbacks of blockchain-based crowdfunding are immutable blockchain records, regulatory unpredictability, network congestion during peak hours, and compliance requirements. Enhancing dispute resolution procedures, creating user-friendly interfaces, streamlining regulatory frameworks, and increasing scalability are all crucial steps in addressing these issues.

The efficiency, transparency, and accessibility of blockchain crowdfunding platforms can be improved by implementing layer 2 scaling solutions, making regulatory guidelines clear, and streamlining dispute resolution procedures. Use layer 2 scaling techniques to relieve network congestion in order to speed up transactions and lower costs. Make regulations clearer in order to boost trust and create a favorable atmosphere for crowdfunding. To increase accessibility and transparency, make user interfaces more user-friendly and dispute resolution processes better. Inform users about crowdfunding procedures and blockchain technology to enable efficient navigation. To fully reap the rewards of blockchain-based crowdfunding, it is imperative to combine regulatory clarity, technological advancements, and user-centric improvements.

III. RESEARCH METHODOLOGY

While exploring various Blockchains, most users tend to prefer Ethereum blockchain for their application development. This is due to the various reasons like big community, more tutorials, more support etc. But there is also another interesting option when choosing a blockchain to base your platform: Internet Computer. Checking both of these against each other:

Aspect	Internet Computer (ICP)	Ethereum
Approach to Decentralization	Uses a subnet containing multiple nodes for each canister	Deploys smart contracts on single nodes
Consensus Mechanism	Chain Key cryptography-based mechanism	Proof-of-Stake (previously Proof-of-Work)
Average Block Time	0.936 seconds	12.08 seconds
Average Transaction Cost	$0.0000022	$2.39
On-chain Storage Cost	$5 (3.95T cycles x 1XDR)	$15,494,409 (12,643.75 ETH)
Supported Programming Languages	Motoko (native), Rust, TypeScript, Python	Solidity (native), Vyper, Yul, FE

Fig 1: Difference between Ethereum and Internet Computer, Referred from binance.com

A. *IC over Ethereum:*

1) Scalability: Internet Computer is developed to deliver better scalability likened to Ethereum. It utilizes an untried consensus mechanism called Threshold Relay and a sharding strategy apprehended as Chain Key Technology to scale out its capacity. This scalability might be advantageous for fundraising projects desiring high transaction volumes or seeking to house a large number of partakers without encountering congestion problems.
2) Cost Efficiency: Internet Computer aspires to deliver cost effective transactions by reducing fees related to smart contract implementation and data storage. Ethereum's gas fees have been a matter of concern, particularly during times of congestion of the network. For fundraising tasks, reducing transaction costs can be vital in increasing the funds at hand for charitable purposes.
3) Decentralized Governance: Internet Computer has a governance model that strives to provide more decentralization as well as community involvement in protocol decisions. This might appeal to fundraising projects looking for a transparent and inclusive governance model where stakeholders are involved in platform upgrades and development.
4) Native Smart Contract: Internet Computer supports native smart contracts written in various programming languages, including Motoko, Rust, and C. This flexibility in smart contract development may be advantageous for fundraising projects that require specific functionalities or have existing codebases in different languages.
5) Interoperability: Internet Computer strives to foster interoperability with other blockchain networks and traditional systems using its Chain Key Technology and canister smart contracts. This interoperability may be useful for fundraising projects looking to integrate with external platforms, legacy systems, or exchange networks.

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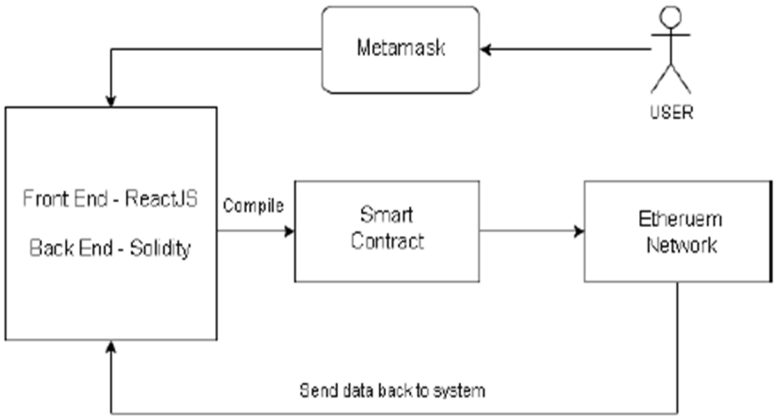

Fig 2: System Architecture

6) Privacy and Security: Internet Computer comprises features such as deterministic finality, cryptographic techniques, and secure enclave technology to enhance privacy and security. These features may provide added assurances for fundraising projects dealing with sensitive data or requiring strong security guarantees.

7) Community Support and Ecosystem Growth: While Ethereum consists of a huge and active developer community, Internet Computer has been growing its environment and looking attractive to developers because of various grants, initiatives, and partnerships. For projects like fundraising, having access to a community that is supportive and a good ecosystem can present valuable expertise, resources and opportunities with chances of collaboration.

It's crucial for fundraising projects to perform a thorough appraisal of their specific needs, technical necessities, and strategic objectives when selecting a blockchain platform. While Internet Computer may offer particular advantages over Ethereum for some projects, each platform has its resilience and constraints that should be carefully reckoned in the context of the project's ideals and restraints.

B. Ethereum over IC:

Developer Ecosystem and Adoption: Ethereum has a well-established and dynamic developer community with a wide range of tools, libraries, and documentation available. This ecosystem makes it easier for developers to build decentralized applications (DApps) and smart contracts for fundraising projects. In distinction, Internet Computer, while promising, are relatively new and may have a smaller developer community and fewer resources available.

1) Smart Contract Capabilities: Ethereum's smart contract functionality is mature and widely used in the blockchain industry. Smart contracts on Ethereum entitle for programmable fundraising mechanisms, such as token sales, automated distribution of funds, and decentralized autonomous organizations (DAOs). While Internet Computer also supports smart contracts, its capabilities and developer tools may still be developing.

2) Interoperability and Integration: Ethereum has comprehensive interoperability with other blockchain networks, tokens, and decentralized finance (DeFi) protocols. This interoperability enables seamless integration with existing projects, wallets, and exchanges, which can enhance the liquidity and accessibility of fundraising tokens. Internet Computer's compatibility with other blockchain networks may be more delimited in comparison.

3) Scalability and Throughput: Ethereum has encountered scalability challenges, especially during periods of high network congestion, resulting in high gas fees and slower transaction times. However, the Ethereum 2.0 upgrade aims to address these scalability issues with the transition to a proof-of-stake consensus mechanism and the implementation of sharding. Internet Computer's architecture also contends to offer scalability improvements, but its performance and throughput in real-world scenarios may need further validation.

4) Security and Auditing: Ethereum has a track record of security audits and standard validation of smart contracts, which helps mitigate the threat of vulnerabilities and exploits. Additionally, Ethereum's decentralized nature and large network of nodes contribute to its resilience against attacks. While Internet Computer also accentuates security features, its security model and audit process may not have been as broadly tested as Ethereum's.

5) Community and Governance: Ethereum has a decentralized governance model involving various stakeholders, including developers, miners, and token holders. Community governance mechanisms, such as Ethereum Improvement Proposals (EIPs) and decentralized autonomous organizations (DAOs), enable collaborative decision-making and protocol upgrades. Internet Computer's governance model may counter, and its community dynamics are still evolving.

Hence, though Internet Computer presents novel features and potential benefits, like its scalable and decentralized architecture, Ethereum's mature ecosystem, network effects and developer tools make it a preferable choice for most blockchain-based fundraising projects currently. Yet, project members must be careful to evaluate their particular requirements and take into consideration factors such as network effects, scalability, and security when choosing the most appropriate blockchain.

C. Limitations in existing fundraising platforms:

Current fundraising platforms, be it digital or traditional, frequently face many drawbacks that obstruct their impact and effectiveness. Some common limitations are:

1) High Transaction Fees: Traditional fundraising platforms, like those dealing with credit card payments and wire transfers, mostly charge high transaction fees. These fees can impact the amount donated, decreasing the overall impact of the donation. Likewise, few digital fundraising platforms incur notable fees, which might prove discouraging to donors or reduce the funds' availability for charity purposes.
2) Lack of Transparency: Most fundraising platforms don't have transparency in how raised funds are put to use. Donors might not have visibility into how their donations are distributed or the effect they have on the intended beneficiaries. With lack of definite accountability measures and reporting mechanisms, trust in the platform and the associated charity organizations can be compromised.
3) Limited Accessibility: Traditional fundraising platforms may have limited accessibility, especially for people in rural and remote areas with improper access to services like banking or internet connectivity. In a similar manner, digital fundraising platforms can exclude people that are not techies or don't have access to computer or smartphones. This lack of accessibility can obstruct reach and decrease the engagement of charity efforts.
4) Centralized Control and Risk of Censorship: Most fundraising platforms are governed under centralized control, where a single body or organization manages the platform and all its operations. This centralization can present risks, like censorship or interference by authorities. Centralized platforms can also be vulnerable to hacking, data breaches and other security threats, making donor information and funds open to risks.
5) Limited Use of Technology: Few traditional fundraising platforms may depend on manual processes or outdated technology, that can cause delays, inefficiencies, or errors. Likewise, digital fundraising platforms often lack advanced features and new technologies, like blockchain, smart contracts, and artificial intelligence, that could ameliorate security, transparency, and efficiency.
6) Fraud and Mismanagement: Fraudulent practices, mismanagement, and improper use of funds are major concerns in fundraising, especially in the absence of proper oversight or accountability mechanisms. Lack of proper due diligence, validation of charitable institutes, and transparent reporting, donors can be at risk of donating to fake or ineffective campaigns.
7) Complex Regulatory Environment: Fundraising platforms, traditional as well as digital, should steer a sophisticated regulatory environment, that changes with jurisdictions and can have compliance requirements for taxation, anti-money laundering (AML), know-your-customer (KYC), and fundraising regulations. Following these regulations might be difficult and can limit the scalability and flexibility of campaign initiatives.

Considering and acting on these limitations needs innovative perspectives, collaboration among stakeholders, and the use of new technologies to derive a more inclusive, transparent, and efficient crowdfunding platform that increases the effect of donations.

Few other fundraising problems highlighted by other researchers include 1) the rewards are delayed 2) campaign creators halt communication with their donators after an unmet delivery date, or 3) the promised result is never delivered and the donors aren't refunded. A different study shows that there were over 75% of fundraising projects delivering delayed results. By executing smart contracts in the fundraising system, we can make a contract that can put on hold a donor's money until any specified date or goal is met. According to the outcome, the amount will either be transferred to the project owners or returned to the donors.

D. Advantages of using Blockchain over traditional applications:

Blockchain-based fundraising platforms propose several advantages over traditional charity platforms, principally due to the innate characteristics of blockchain technology. Here are some key benefits:

1) Transparency and Accountability: Blockchain technology provides a transparent and immutable record of transactions. Every donation completed on a blockchain-based fundraising platform is recorded on the blockchain, assuring transparency in the flow of funds. Donors can track their contributions in real time and confirm that their donations are used as intended. This transparency enhances accountability and trust in charitable organizations.

2) Reduced Intermediaries and Lower Fees: Traditional charity platforms often involve multiple intermediaries, such as banks, payment processors, and administrative entities, which can increase transaction costs and delays. In contrast, blockchain based fundraising platforms facilitate direct peer-to-peer transactions, eliminating the need for mediators and reducing associated fees. As a result, more of the donated funds can directly benefit the intended recipients.

3) Global Accessibility and Inclusivity: Blockchain technology enables borderless transactions, allowing donors and beneficiaries to participate in fundraising initiatives from anywhere in the world. This global accessibility extends the reach of charitable measures and allows individuals in underserved regions to access financial assistance and support. Additionally, blockchain-based platforms can onboard unbanked residents, providing financial inclusion to those without access to formal banking services.

4) Decentralization and Resistance to Censorship: Blockchain based fundraising platforms are decentralized networks that function without a central authority or single point of control. This decentralization lowers the threat of censorship, as transactions are validated by distributed nodes in the network. Charitable initiatives on blockchain platforms can thus avoid censorship or interference by governments or other centralized entities, assuring freedom of expression and support for causes that may be politically prudent.

5) Enhanced Security and Fraud Prevention: Blockchain technology employs cryptographic techniques to secure transactions and data stored on the blockchain. The immutability of the blockchain guarantees that once a transaction is recorded, it cannot be altered or tampered with retroactively. This security feature reduces the risk of fraud and corruption in charitable activities, as all transactions are transparently recorded and auditable.

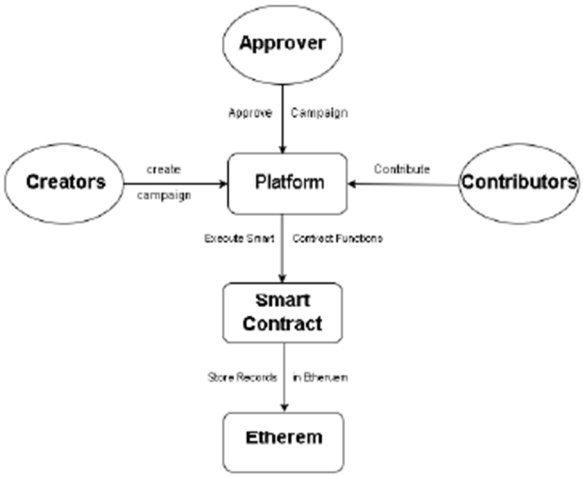

Fig 3: Workflow of the application

6) Smart Contract Automation: Blockchain platforms often support smart contracts, which are self-executing contracts with predefined conditions written in code. Smart contracts can automate various elements of fundraising, such as donation collection, fund distribution, and execution of contractual agreements. This automation reduces organizational overhead, streamlines processes, and assures that funds are distributed according to predetermined regulations and standards.

7) Tokenization and Incentive Mechanisms: Some blockchain based fundraising platforms leverage tokenization to represent ownership stakes or participation rights in charitable projects. Tokens can incentivize donors by providing rewards, recognition, or voting privileges based on their contributions. Tokenization also enables fractional ownership of assets and fosters the creation of new economic models for incentivizing benevolence and impact investing.

Overall, blockchain-based fundraising platforms deliver a paradigm change in the way charitable contributions are appealed, managed, and distributed, providing increased transparency, efficiency, and inclusivity compared to traditional charity platforms.

E. Limitations of using Blockchain:

While blockchain-based fundraising platforms offer multiple edges, they also face several challenges:

1) Scalability: Scalability stays as a substantial challenge for many blockchain networks, including those employed for fundraising platforms like Ethereum. High transaction amounts can cause congestion and inflated fees, defining the platform's ability to process contributions efficiently, particularly during spans of increased demand.
2) Volatility of Cryptocurrency: Numerous blockchain-based fundraising applications accept contributions in cryptocurrencies which are understood for their price fluctuation. The value of contributed cryptocurrencies can vary extensively, impacting the purchasing ability of the assets and raising uncertainty for both donors and recipients.
3) User Experience and Adoption: Blockchain technology can be complicated for non-technical users, resulting in usability challenges for fundraising platforms. Issues such as wallet management, transaction confirmation times, and understanding blockchain terminology may hinder potential donors from participating in blockchain-based fundraising initiatives.
4) Regulatory Uncertainty: Regulatory frameworks surrounding blockchain and cryptocurrencies are still growing in many jurisdictions. Fundraising platforms must navigate complicated lawful and compliance necessities, including regulations related to securities, taxation, anti-money laundering (AML), and know-your-customer (KYC) procedures. Uncertainty about regulatory compliance can create barriers to adoption and investment.
5) Privacy Concerns: While blockchain delivers transparency via its immutable ledger, it also introduces privacy concerns, particularly for sensitive data related to beneficiaries and donors. Public blockchains account transaction details permanently on the ledger, possibly revealing personal data to unauthorized access or misusage. Counteracting privacy protection with transparency is a challenge for blockchain-based fundraising applications.
6) Smart Contract Vulnerabilities: Smart contracts, which initiate fundraising processes and control the allocation of funds, are sensitive to vulnerabilities, coding errors, and exploits. Security violations in smart contracts can result in failure of funds or disorder of fundraising practices. Testing and auditing smart contracts for susceptibilities is important but can be resource-intensive.
7) Integration with Traditional Systems: Combining blockchain based fundraising applications with traditional financial platforms, such as banks, payment processors, and regulatory reporting mechanisms, can be challenging. Lessening the gap between blockchain and existing technologies needs interoperability measures, regulatory compliance standards, and cooperation among stakeholders.
8) Environmental Concerns: Few blockchain networks, especially those that depend on energy-intensive consensus mechanisms like proof of work (PoW), have concerns about their environmental consequence. The energy consumption with PoW consensus algorithms has a contribution to carbon emissions and environmental decline, leading to controversies about the sustainability of blockchain.

Having these limitations, continuing research and development endeavors strive to counter these challenges and ameliorate the usability, scalability, security, and regulatory compliance of blockchain-based fundraising applications. As the technology evolves and adoption rises, blockchain has the potential to revolutionize the way charitable contributions are requested, managed, and distributed, fostering greater transparency, efficiency, and trust in benefaction.

IV. SUMMARY AND CONCLUSIONS

In an overview, this research has explored the huge potential of blockchain-based fundraising applications. These platforms make use of the inherent benefits of blockchain technology, like security, transparency, decentralization, etc, to manage many of the constraints current in traditional fundraising approaches. By eradicating intermediaries as well as delivering an immutable ledger of commerce, blockchain improves accountability and trust between contributors and fundraisers.

The research of diverse case studies and present performances has displayed that blockchain-based applications can greatly decrease costs, enable global participation, and streamline processes, therefore democratizing access to budget. Additionally, the intro to smart contracts makes the execution of agreements automatic, assuring that funds are liberated exclusively when predefined requirements are satisfied, thereby mitigating threats associated with fraud and fund mismanagement.

Even when blockchain has these advantages, challenges like technological scalability, user adoption and regulatory uncertainty remain.

These obstructions demand focused efforts from stakeholders, developers also policymakers, and the broader community, to design robust frameworks as well as user-friendly resolutions. Forthcoming research should concentrate on researching these challenges in grander profoundness, and running longitudinal examinations to evaluate the long-term effectiveness and consequence of blockchain-based crowdfunding.

In conclusion, though still in its developing phases, blockchain technology carries substantial assurance for revolutionizing fundraising methods. By promoting a transparent, efficient and more protected ecosystem, blockchain-based fundraising applications can designate creators, support charitable motivations, and steer economic development, eventually donating to a more inclusive and impartial financial ecosystem.

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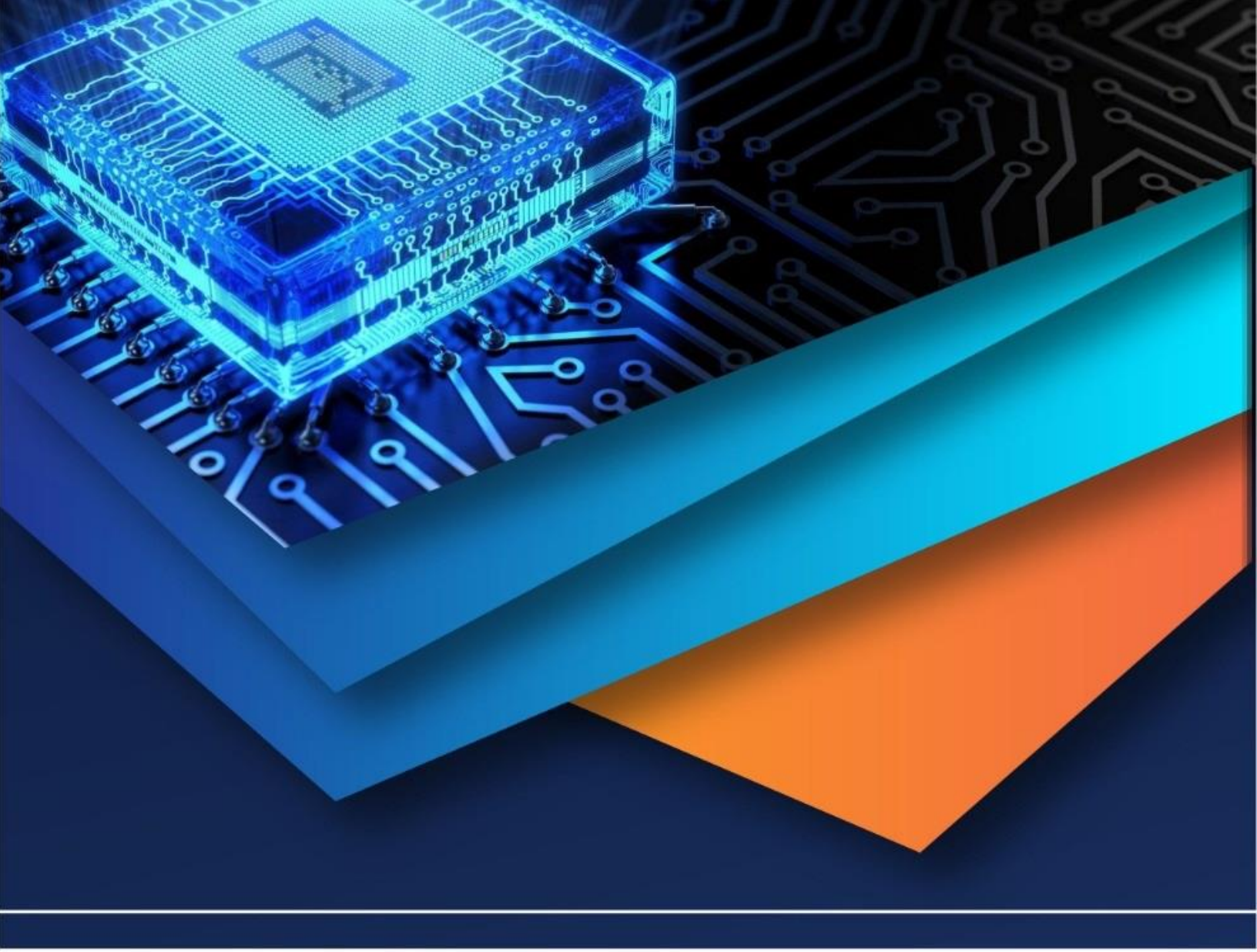

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