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IoT Based System for Rating Smart Contract to Evaluate Accuracy of Blockchain

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Abstract: The increasing adoption of blockchain technology has revolutionized various industries by providing a decentralized and secure environment for transactions. Smart contracts, self-executing contracts with coded terms, are a fundamental component of blockchain systems, ensuring transparency and automation. However, the accuracy and reliability of smart contracts are critical factors in ensuring the integrity of blockchain transactions. In this context, this research proposes an Internet of Things (IoT)-based system designed to evaluate and rate the accuracy of smart contracts within blockchain networks. The IoT infrastructure integrates real-world data from physical devices into the blockchain, creating a dynamic and responsive environment. Leveraging data from IoT-connected devices, the proposed system continuously monitors the execution of smart contracts, verifying their outcomes against real-world conditions. The collected data is then analyzed to assess the accuracy of the smart contracts in reflecting the intended business logic. Key components of the proposed system include a decentralized network of IoT sensors, data oracles for interfacing between the physical and digital realms, and a rating mechanism that quantifies the accuracy of smart contract executions. Machine learning algorithms may be employed to analyze historical data and predict potential discrepancies, contributing to the proactive improvement of smart contract accuracy. The evaluation framework takes into account parameters such as transaction speed, data integrity, and the consistency of smart contract outcomes with real-world events. The system aims to enhance the trustworthiness of blockchain transactions by providing users and stakeholders with a transparent and real-time rating of smart contract accuracy. This research contributes to the ongoing efforts to enhance the reliability and efficiency of blockchain technologies. The proposed IoT-based rating system offers a practical solution for businesses and organizations seeking to validate the accuracy of smart contracts in their blockchain transactions. The findings from this study are expected to have implications for industries relying on blockchain technology, including finance, supply chain, and healthcare, where precise execution of smart contracts is crucial for success. In present research digital marketing of NFT and crypto assets has been made considering factors that influences blockchain user engagement.

Keywords: *IoT system, smart contract, Blockchain, Accuracy*

1. Introduction

Technology improvements have been the driving force behind the fast expansion of the online service sector, which has resulted in a transformation in the manner in which companies connect with their clients.

Within the context of this digital era, when connection and data are of the utmost importance, the incorporation of IoT stands out as a revolutionary driver for improving consumer interaction. Within the context of the online service industry, this article investigates the synergies that exist between IoT and digital exposure techniques, with the objective of examining the revolutionary potential of this integration.

The nature of the online service business, which encompasses a wide range of offers ranging from e-commerce platforms to subscription-based services, is distinguished by its dynamic and competitive nature. An growing number of organizations are turning to creative technologies in order to succeed in this environment, and the Internet of Things is emerging as a significant participant in the process of altering consumer experiences. With its network of linked devices and sensors, IoT offers chances to capture real-time data that have never been seen before. These opportunities include insights into the behaviors, preferences, and interactions of blockchain users with digital platforms.

From the point of view of digital exposure, gaining a grasp of and making use of this vast amount of data presents new opportunities for the creation of user experiences that are both customized and immersive. With the capacity to

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leverage data from IoT, marketers are given the opportunity to personalize their plans with a level of accuracy that was before unseen. This study is to investigate the ways in which IoT might be strategically incorporated into digital exposure campaigns, therefore allowing organizations to provide content, promotions, and suggestions that are highly targeted and contextually relevant.

The ultimate objective is to encourage a more profound degree of consumer connection, going beyond the conventional methods that have been used. The purpose of this study is to uncover the ways in which organizations operating in the online service sector may harness IoT to enhance their digital exposure strategies. This will be accomplished by diving into real-world case studies and practical implementations. In addition, it tackles concerns about the privacy of data, the security of data, and the ethical implications of using Internet of Things technologies, acknowledging the significance of responsible and transparent use of these technologies.

1.1. IoT Technology

IoT technology allows businesses to collect data on blockchain user behavior, preferences and usage patterns. This data can be used to create personalized experiences and engage blockchain users more meaningfully. For example, an IoT-enabled smart home device can collect data on the user's behavior and preferences, such as the temperature they prefer or the time they wake up. This data can be used to create a personalized experience for the user and engage them more meaningfully.

a) The ability to tailor services to each individual consumer by tracking their actions and preferences using the Internet of Things (IoT). Increased happiness, loyalty, and retention among blockchain users may result from this.

b) Businesses may use IoT to identify issues before they escalate and implement preventive measures to resolve them, which improves blockchain user service via proactive and predictive actions. By way of illustration, a smart appliance that is connected to the internet of things might anticipate a problem and notify the service provider or client in advance.

c) Enhanced blockchain user loyalty via ongoing engagement: The Internet of Things enables organizations to consistently connect with consumers, leading to higher blockchain user loyalty and retention rates.

d) A boost to the company's image as a whole as a result of happier blockchain users: The Internet of Things (IoT) enables companies to provide happier blockchain users with more tailored experiences and proactive support, both of which contribute to a favorable public perception of the brand.

1.2. Online Service Industry

The online service sector facilitates the provision of a wide range of services to individuals, organizations, and governments via the medium of the internet. Financial services, banking services, and many more types of services have recently been available to the general public over the internet. journeys, policies, schools, and a plethora of other things. Thanks to today's technological advancements, managing your bank accounts has never been easier. You can literally do it all from the comfort of your own home, and you can receive and send payments from any location in the globe. People are able to get more done in less time and with less effort because of this. Within the economies of developed industrialized nations, the service sector has grown at a faster rate than any other part of the economy. Companies in the service industry provide a wide variety of services to households, companies, and public and private entities. Health services, FIRE, and occupational services make up the bulk of the service sector. Marketable mediators and providers of "processing" services are two subsets of the service industries. One would assume that the service sector relies heavily on information and expertise. This is why many services lend themselves well to the convenience of online shopping and the Internet. In a sector where productivity has been largely unaffected by the IT boom, e-commerce has remarkable prospects to boost turnover efficiency.

1.3. Role of Online Service Industry in Digital Exposure

Rating smart contracts to evaluate the accuracy of blockchain transactions is a critical aspect of ensuring the reliability and trustworthiness of decentralized applications. Here's a framework for rating smart contracts to assess their accuracy in a blockchain environment:

1. Smart Contract Design Analysis: Evaluate the design of the smart contract to ensure it accurately captures the intended business logic and contractual agreements. Assess the completeness and clarity of the contract's code, considering potential edge cases and exceptional scenarios.

2. Code Quality and Security Audits: Conduct thorough code reviews and security audits to identify vulnerabilities and potential bugs. Smart contract auditing tools and third-party auditors can be employed to assess the quality of the code and its adherence to best practices.

3. Functional Testing: Implement comprehensive functional testing to verify that the smart contract behaves as intended under various conditions. This includes positive and negative test scenarios to cover a wide range of potential use cases.

4. Integration Testing with Oracles: If the smart contract relies on external data, such as real-world events, integrate and test with oracles to ensure that the contract accurately processes and responds to the external inputs.

5. Data Consistency and Oracle Reliability: Evaluate the reliability and consistency of the data provided by oracles. Assess the mechanisms in place to handle oracle failures or malicious data inputs, ensuring the smart contract's accuracy even in the presence of unreliable data sources.

6. Performance Testing: Assess the performance of the smart contract under different workloads to ensure that it meets scalability requirements. Evaluate transaction speed, latency, and resource consumption to guarantee efficient and accurate execution.

7. Historical Transaction Analysis: Analyze historical transactions involving the smart contract to identify any patterns of inaccuracies or unexpected behaviors. This can be done by examining the blockchain's transaction history and related data.

8. Machine Learning and Predictive Analysis:

- Implement machine learning algorithms to predict potential discrepancies or anomalies in smart contract executions based on historical data. This proactive approach can help identify and address accuracy issues before they become critical.

By implementing this comprehensive rating framework, blockchain developers and stakeholders can ensure the accuracy of smart contracts, fostering trust and reliability within decentralized applications and the broader blockchain ecosystem. Regular evaluations and continuous improvement efforts are essential to adapt to evolving challenges and maintain the accuracy of smart contract executions over time.

1.4 Influencing factors effecting accuracy blockchain

Implementing a royalty program, voting mechanisms, airdrops, and regular tasks on Twitter can have a significant impact on reliability of blockchain and crypto assets. Here's an overview of how each strategy contributes:

1. Royalty Program: A royalty program incentivizes creators and encourages them to produce high-quality content. Blockchain users, knowing that creators will receive ongoing royalties for their work, may be more inclined to purchase and engage with NFTs. Promote the royalty program across social media, emphasizing the benefits for both creators and buyers. Regular updates on earnings and success stories can create a positive narrative and attract more participants.

2. Voting Mechanisms: Voting mechanisms, such as allowing the community to vote on upcoming NFT releases or features, create a sense of inclusivity and involvement. Blockchain users feel a connection to the project and are more likely to engage in discussions and promotional activities. Use voting events as exposure campaigns. Leverage social media to encourage users to vote, share their choices, and generate buzz around the project. Highlight the impact of community decisions to reinforce the importance of participation.

3. Airdrops: Airdrops provide a direct incentive for engagement by distributing free tokens to existing holders or participants. This generates excitement and rewards users for their loyalty and involvement. Announce airdrops through social media channels, creating a sense of urgency and exclusivity. Encourage users to share the news to reach a wider audience. Airdrops canbe promoted as a limited-time opportunity, fostering a sense of scarcity.

4. Regular Tasks on Twitter: Regular tasks, such as retweets, likes, or sharing content, can create a consistent and active community. Users participating in these tasks contribute to the visibility of the project and help in building a broader audience. Design engaging tasks that require users to interact with the content creatively. Regularly communicate the tasks through tweets, ensuring clarity on instructions and rewards. Create a dedicated hashtag for tracking and encourage users to use it when sharing their contributions.

2. Literature Review

W. Nahili (2018) did research on Social Media.This work aims to present a streamlined method for accurately forecasting sentiment from unprocessed, disorganized data. The goal is to extract views from the internet and forecast online client preferences. This information is highly important and essential for economic and exposure experts [1]. Severyn Aliaksei [2] did work on twitter sentiment analysis and considered deep convolutional neural networks. A Tumasjan[3] focused on predicting elections. They did digital exposure with Twitter and discussed regarding political sentiment. Vishal A. Kharde et al. [4] did survey on sentiment analysis. Author considered twitter data to accomplish digital market. A. Pak [5] considered twitter as a Corpus to perform sentiment analysis along with opinion mining. Gupta, M. et al (2023) did a research which found that the lifestyle provided by 9NFTMANIA is known as NFT culture. This name was attributed to the lifestyle. Within this society, non-fungible tokens (NFTs) would serve a diverse array of purposes, encompassing greetings, invitations, certificates, and membership cards, among several other applications. Executing a secure transfer of digital assets might be feasible if conducted in this manner, with the value of this non-fungible token being decided by a specified standard. This is an action that should be undertaken irrespective of

whether the person desires to convey appreciation to another person or merely extend a pleasant morning greeting. Transferring non-fungible tokens (NFTs) to another person's wallet is necessary. Moreover, a limitation would be imposed on the availability of these greeting NFTs, so allowing for the potential occurrence of a sudden surge in the price of the item being acquired. Moreover, by leveraging web 3.0 technologies to authenticate NFT holders in the Metaverse, those who own NFTs will have the ability to get premium online services [6]. This is the antithesis of the current state of affairs. Verification of NFT holders would make this achievable. The notion of blockchain was initially introduced by M. Gupta and colleagues in the year 2023. Subsequently, non-fungible tokens (NFTs), which are often referred to as NFTs, have attracted significant attention, especially in the domain of digital assets and decentralized technology. The robust correlation between these two concepts has resulted in an increase in their popularity, which has been accompanied by this association. Blockchain technology serves as the foundational technology enabling non-fungible tokens (NFTs) to function as digital assets with absolute uniqueness. The correlation between blockchain technology and NFTs (Non-Fungible Tokens) is mutually beneficial for all parties concerned. Non-fungible tokens (NFTs), often known as digital money, employ blockchain technology to address the longstanding challenge of demonstrating ownership and validity in the digital realm. To address the problem of digital scarcity, one might employ non-fungible tokens, often known as NFTs. By virtue of their ability to depict unique assets on the blockchain, they can overcome this barrier. Artists, including as musicians, game developers, and painters, have the ability to convert their digital creations into tokens and sell them as unique, limited-edition commodities [7]. This functionality is enabled by the blockchain technology. Tokenization is an instance of digital asset management. R. Gupta and colleagues (2023) conducted a study on the ecological aspects of decentralized financial ecosystems. The authors' findings highlight the crucial role of liquidity pools in preserving the value of tokens. Liquidity pools play a crucial role in maintaining stability by effectively employing arbitrage. Regarding the contribution methods, this specific one has great importance in the involvement of liquidity pools. Consumers often make purchases while the token's value is relatively low. Conversely, sales occur when the item is priced over the typical level. Arbitrage is possible due to the presence of liquidity pools, which enable traders to directly conduct these trades on decentralized exchanges. This leads to the potential for arbitrage. Consequently, arbitrage is a genuinely feasible and profitable sector. Consequently, arbitrage is a lucrative economic opportunity. Arbitrageurs consistently apply pressure, leading to the token's value reverting back to its intended peg. This, in turn, promotes enhanced stability by fostering further stability [8]. D. Gupta and colleagues (2023) concluded that the level of popularity is the primary factor influencing the perceived value of greetings, as discussed in their research findings. Furthermore, it has been ascertained that the Love Emogie is exclusively obtainable in a restricted quantity. This is a recent discovery. The limited supply of just 43 Love Emojis has played a role, with the heightened demand for non-fungible tokens (NFTs) being one of the factors contributing to this situation. NFTs are seen intrinsically rare, therefore explaining the rationale behind this. However, it is crucial to highlight that the factors of cost and use case exert a substantial influence on the result of the scenario. The value is 9. In 2023, R. Issalh and his colleagues conceived the notion of a cryptocurrency endeavor, which they named Pi Network. Pi Network's innovative approach to mining and accessibility is a key factor in its widespread recognition. The website, founded in 2019, offers users the opportunity to mine the network's indigenous digital money, referred to as Pi, straight from their mobile devices. Users of the site were given the opportunity to access this potential. The platform aims to achieve its objectives by democratizing the mining process and increasing accessibility to cryptocurrencies for a broader user base. One especially fascinating element is that Pi Network utilizes the Stellar Consensus Protocol as the foundation for its blockchain. This protocol's hierarchy of priorities assigns equal importance to the concepts of security, decentralization, and transaction speed. Although Pi Network is now in its early stages of growth, it highly values the active involvement of its members. The user's text is "[10]". The user's text is "[10]". This is achieved by providing individuals with resources, therefore incentivizing them to actively engage in the project and make contributions to it. A study conducted by A. Duggal and colleagues (2023) investigated the importance of non-fungible token avatars in the metaverse. The researchers focused largely on the role that these avatars play in redefining various facets of digital ownership, such as self-expression and user engagement. The research also examines the challenges and obstacles associated with the commercialization of NFT avatars. This is an additional point to the one mentioned earlier. It considers a wide range of factors, such as market dynamics, technological challenges, and user acceptance, among other factors. The ongoing research encompasses a wide range of non-fungible tokens (NFTs) issued by various NFT brands. It is possible that this non-fungible token (NFT) will be used in the Meta verse in the future. This potentiality arises at a certain juncture. The research article concludes with a case study centered around an NFT named "Sizzling monster". At the inception of its existence, Young Parrot Platform sold it to several non-fungible token (NFT) firms [11]. These firms have already obtained it. The accessibility of

this NFT is significantly limited to a small number of individuals. The advice provided by M. Gupta et al. (2023) to avoid speculating in the cryptocurrency market during NFT transactions serves as a reminder to exercise care, do thorough research, and engage in responsible investment. The use of these principles will result in the development of a more reliable and enduring ecosystem. Once fully implemented, this ecosystem will enable the blockchain technology to fulfill its promise beyond the narrow confines of short-term market fluctuations. Engaging in speculating in the bitcoin market requires a strategy that is both cautious and well-informed. This is particularly accurate when handling transactions with non-fungible tokens (NFTs). The cryptocurrency market exhibits a significant degree of intrinsic volatility, which is exacerbated by the existence of non-fiat currencies in the area. A prominent characteristic of the bitcoin market is its occurrence. Given the volatile nature of pricing, it is imperative for investors to display prudence and resist the temptation to engage in speculation. This is due to the volatility of pricing, which leads to unforeseen fluctuations and explains the observed outcome. The value of non-fungible tokens (NFTs) is not decided by traditional fundamentals. Instead, it is influenced by factors like as the perceived scarcity of the tokens, the demand for them, and their cultural importance [12].

3. Problem Statement

It has been very challenging to assure the accuracy and reliability of blockchain. Interoperability concerns pose another significant hurdle. The multitude of IoT devices from different manufacturers often operate on distinct protocols, making seamless integration and communication challenging. Ensuring that various devices can work together cohesively to provide a unified blockchain user experience requires standardization efforts and collaboration across the industry. Security remains a paramount concern, especially in the context of IoT devices. The interconnected nature of these devices creates a broader attack surface, making them susceptible to cyber threats. Ensuring robust security measures to protect data and the integrity of IoT systems becomes imperative to build and maintain trust. Data management and analytics challenges also emerge, given the sheer volume of data generated by IoT devices. Effectively processing, analyzing, and deriving actionable insights from this data require advanced analytics capabilities. Businesses must invest in the necessary infrastructure and talent to derive meaningful value from the wealth of blockchain user data collected through IoT devices. Furthermore, the cost of implementing and maintaining IoT systems can be a significant barrier, particularly for smaller businesses. The initial investment in IoT infrastructure, coupled with ongoing maintenance and updates, can strain resources. Businesses must carefully weigh the benefits against the costs to ensure a viable return on investment. Navigating these challenges will be crucial for businesses seeking to leverage IoT for enhancing blockchain user engagement in the online service industry. A strategic and holistic approach that prioritizes privacy, security, and seamless integration will be essential for successful implementation and long-term blockchain user satisfaction.

4. Proposed Work

Improving blockchain accuracy and reliability on IoT (Internet of Things) requires the integration of technology, data analytics, and new techniques.

1. Gain Insight into blockchain user Behavior: Collect Data on Blockchain user Preferences and Behavior using Internet of Things Devices. You may learn a lot about your consumers' online behavior by observing their interactions with your services, products, and platforms, as well as by analyzing their purchase histories and other pertinent data.

2. Data Analytics : Make use of data analytics to handle the data gathered by IoT devices. Make targeted advertising efforts by analyzing data for trends, preferences, and patterns. Make material, promotions, and suggestions that are specific to each blockchain user's tastes.

3. Interactions with Blockchain users in Real-Time: The Internet of Things allows for communication in real-time. Take use of this feature to have a conversation with a client right away by using chatbots and virtual assistants that are driven by data from the internet of things to answer their questions and resolve their problems right away.

4. Improve Blockchain user Support: By integrating blockchain user support systems with data collected from IoT devices, you may better recognize and handle blockchain user concerns before they escalate. This will allow for more efficient and tailored help.

5. Incorporate gamification components utilizing data from the Internet of Things (IoT). Make use of blockchain technology to build loyalty programs or challenges tied to consumer actions and accomplishments; use cryptocurrencies as an example of a safe and transparent reward system.

6. Think About Using NFTs to Give Blockchain users Access to Exclusive Digital Assets or Experiences. Include NFTs in your loyalty program or use them for exclusive promotions by giving members early access to new products or services, hosting virtual events, or creating limited edition content.

7. Implementing Blockchain for Transparency: Make use of blockchain technology to improve the openness of financial transactions, particularly those involving

cryptocurrency. By highlighting the openness and security that blockchain technology provides to your digital assets, you can gain your clients' trust and effectively promote its usage.

8. Top Products Recommended by the Internet of Things: Maximize product suggestions by utilizing data from the Internet of Things. If a consumer is looking at certain products, for instance, IoT may offer up-to-the-minute information on similar products or tailored recommendations.

9. Integration with Social Media: Showcase your digital assets and IoT-enabled features on social media. Interact with clients on these channels, make content that people want to share, and think about launching social media campaigns to showcase the one-of-a-kind digital experiences made possible by the Internet of Things and digital assets.

10. Inform and Engage: Inform your consumers about the advantages of the Internet of Things (IoT) and how it improves their experience as a whole. Make sure they understand how to utilize digital assets, such as cryptocurrencies and NFTs, and allay their fears about their security and legitimacy.

Keep in mind that the digital exposure and technology world is always changing, so it's important to frequently evaluate your strategy, get feedback, and adjust your approach accordingly.

5. Result and Discussion

During simulation digital exposure made to enhance blockchain user engagement with IoT in online service industry has been considered. Twitter handle of world famous NFT brand “9NFTMANIA” has been considered to focus on digital market perspective. There are different mechanism that are considered by 9NFTMANIA to make blockchain user engagement are allow them to vote, retweet and providing them air drops. Blockchain user engagement is supposed to be enhanced by making use of such practices.

Considering factors that are influencing the blockchain user involvement different criteria are considered that are shown in following table.

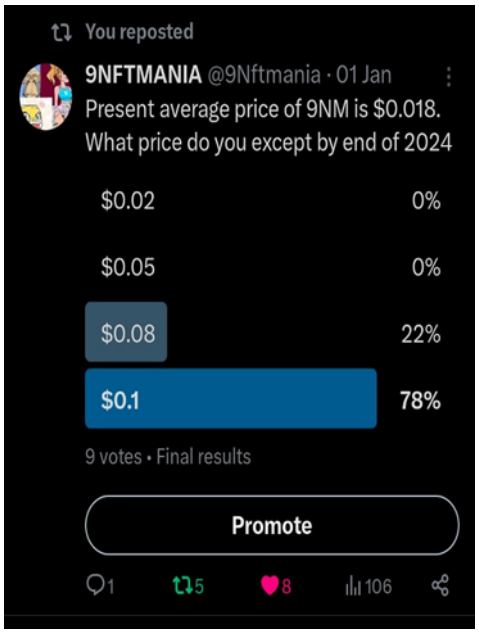

Fig 1 Voting for Crypto Token

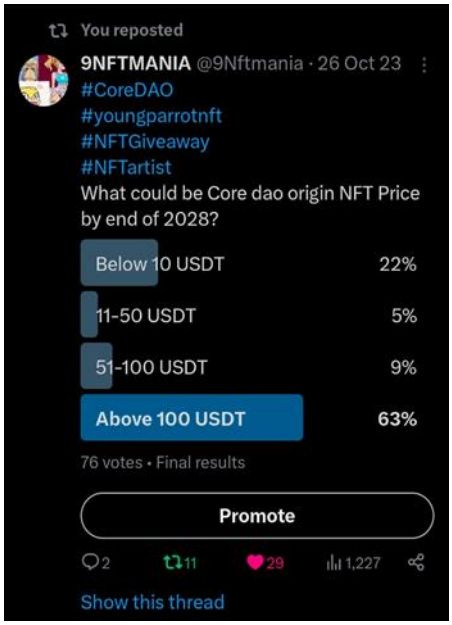

Fig 2 Voting to enhance blockchain user engagement for price prediction of NFT

Table 1 Criteria’s considered to enhance blockchain user engagement

Product	Voting	Airdrop	Royalty program	Regular task
NFT	65	12	20	3
Crypto token	70	11	15	4

Table 1 is presenting the trend considering criteria’s that influences the blockchain user engagement and following charts are visually presenting the blockchain user

sentiment toward different criteria's.

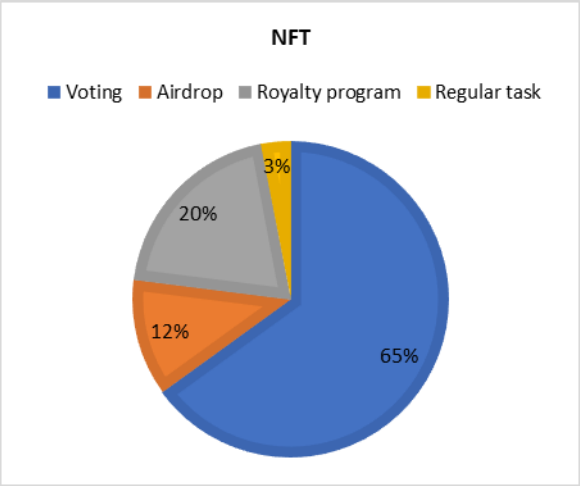

Fig 3 Distribution of Blockchain user engagement in NFT

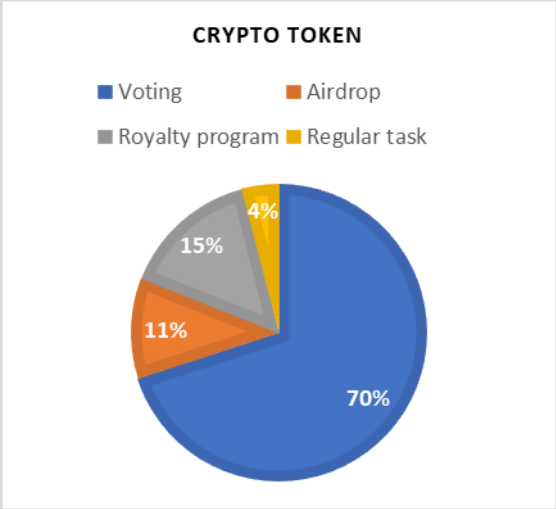

Fig 4 Distribution of Blockchain user engagement in Crypto token

6. Conclusion

It has been concluded that there are different factors that influences the involvement of blockchain user in exposure of crypto assets such as allowing them to vote, providing them air drops, allowing them to participate in royalty program. Different blockchain user has different sentiment and reaction toward different blockchain user's engagement program but it isobserved that airdrops and voting are making significant impact on engagement of blockchain user. Moreover, regular task provided to blockchain user allow limited engagement.

7. Future Scope

The future scope for enhancing blockchain user engagement with IoT in the online service industry from a exposure perspective holds tremendous potential, with several exciting developments anticipated. Firstly, the proliferation of edge computing is expected to play a pivotal role. As IoT devices become more sophisticated, edgecomputing capabilities will empower businesses to process data closer to the source, reducing latency and enabling real-time, personalized interactions with blockchain users. Artificial Intelligence (AI) and machine learning algorithms are poised to further transform blockchain user engagement. The integration of AI with IoT can enable predictive analytics, allowing businesses to anticipate blockchain user needs and deliver proactive, personalized recommendations. This fusion of technologies has the potential to revolutionize how exposure campaigns are designed and executed, ensuring a more tailored and effective approach.

Blockchain technology is likely to contribute significantly to the future of blockchain user engagement with IoT. Blockchain can enhance the security and transparency of blockchain user data, fostering greater trust. Blockchain users can have more control over their data, granting permissions for its use, and blockchain can provide an immutable record of blockchain user interactions, thereby enhancing accountability in exposure practices.

The evolution of 5G networks will also be a catalyst for enhanced blockchain user engagement. The increased bandwidth and reduced latency offered by 5G will enable faster and more reliable communication between IoT devices, leading to seamless and immersive blockchain user experiences. This can particularly impact industries that rely on augmented reality (AR) and virtual reality (VR) technologies for exposure purposes.

Augmented Reality (AR) and Virtual Reality (VR) itself represent an exciting frontier. The integration of AR and VR technologies with IoT devices can create immersive and interactive exposure experiences. Blockchain users can virtually experience products or services before making a purchase decision, contributing to a more engaging and informed consumer journey.

As IoT ecosystems continue to expand, ensuring interoperability among diverse devices will be crucial. Standardization efforts and the development of open protocols will facilitate a more seamless integration of IoT devices, enabling businesses to create comprehensive and interconnected blockchain user engagement strategies.

The future of enhancing blockchain user engagement with IoT in the online service industry is marked by the convergence of cutting-edge technologies. Businesses that strategically harness the potential of edge computing, AI, blockchain, 5G, and immersive technologies are likely to redefine the landscape of exposure, offering blockchain users more personalized, secure, and compelling online experiences.

Conflicts of interest

The authors declare no conflicts of interest.

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