Blockchain Based Employee Stock Ownership Plan

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Abstract: An innovative ESOP (Employee Stock Ownership plan) based on blockchain which is designed with the help of principles of blockchain technology focuses on the aspects of transparency as well as security and efficiency. The carrier designed this fresh system that specifies employees to buy shares of the organization and keep them in a secure account thus granting them a partial ownership of the firm and linking their interests to that of the organization's success. The blockchain is such a technology that all transactions, including the buying, selling, and transferring of shares, are stored in a decentralized and unchangeable ledger. Therefore, the transactions are transparent and the risk of fraud or manipulation is eliminated. Of relevance is the fact that the technology in question automates several administrative processes such as dividend distribution and voting rights, sparing the management the time it takes to run through those procedures. Interestingly, smart contracts are the foundation for the establishment of rules and conditions according to which share allocation and distribution are going to be done with the result of fairness and accuracy being sadly notch high. The blockchain-based ESOP gives employees a clear and real-time view of their ownership, and a platform to actively participate in the decision-making processes of the company. Furthermore, it becomes an employee motivation tool with stock ownership and giving a reward, so staffers stay more engaged and loyal to their company. One thing is clear, to be effective the employee stock ownership system needs to be retooled. A hitherto inclusive but more transparent version of employee stock ownership that benefits the company and its employees should be the ultimate goal. The new way of ESOP management through the blockchain technology is a way to simplify the processes, to create trust and to make the environment more secure and efficient for both employees and organizations.

INTRODUCTION

The lifecycle of the technologies with the speed of modern days has over time from time to time changed the ways of doing business and interacting with stakeholders. The use of blockchain in different industries makes this era of innovation outstanding. This is because it always make them have a unique characteristic of unbeaten, transparency, security and efficiency. In the areas that are going to be the biggest beneficiaries of these capacities, there is the Employee Stock Ownership Plans (ESOPs.)Incorporating workers into company ownership and forming a common bond around corporate goals, ESOPs are a main tactic for boosting employee passion and enthusiasm. A problem that heterogeneous ESOPs may face at present is the lack of transparency and the complicacy of their administration. The project will be an attempt to restructure and improve the structure and the way Employee Stock Ownership Plans operate by using blockchain technology. Together, blockchain is a distributed, decentralized, and immutably-trusted ledger that provides an immutable record-keeping that is transparent and cannot be tampered. The purpose of this project is to provide for the remediation of the current ESOPs systems' opacity and high level efficiency of current systems through the use of blockchain. Basically, the smart contracts i. e. self-executing agreements where terms are in code, are what we are relying on to simplify and automate the various functions of ESOPs. They cover issuing stock, vesting strategies schedules, dividend payouts among others—reducing the potential for errors, risks, and overall increase in operational efficiency.

In addition, this project takes a view of digitizing ESOP where fractional ownership shares are presented in the form of digital tokens on the blockchain. This tokenization method of sharing also makes way for fractional ownership which is a way of giving employees more control over their shares. However, it is of utmost significance to ensure in this regard that sufficient safety measures including the use of firewalls and other security systems are in place. Hence, blockchain gives an outstanding response to this problem and protects information integrity and employee data as well as their record transactions thanks to its decentralization and cryptographic

properties. By blending blockchain technology with ESOP, it tries to build a more transparent, secure and equitable platform. By using such ownership structures employees and organizations will, no doubt, jointly be able to forge a more cooperative and productive future through decreasing administrative costs, assuring faithfulness and establishing trust among people.   .

SYSTEM ARCHITECTURE

Context Diagram

The blockchain-based employee stock ownership plan's structural relation chart indicates how the system enunciates with the exterior parties. The blockchain, which is the infrastructure that makes the transactions and the smart contract execution safe, is the main component. Administrators essentially handle stock issuance and compliance while the employees are focus on system transactions and allocation of stocks. Such technology makes sure the regulating bodies are informed and the financial systems updated via compliance reporting and financial systems. The auditors and the legal counsel are examples of the external stakeholders who might communicate with the system. The aim of this graphic is to facilitate communication and alignment between all the stakeholders, who are the developers and other species, within the system we are dealing with. Therefore, it offers a synthesis of the system's stakeholders, scope, and important interactions.
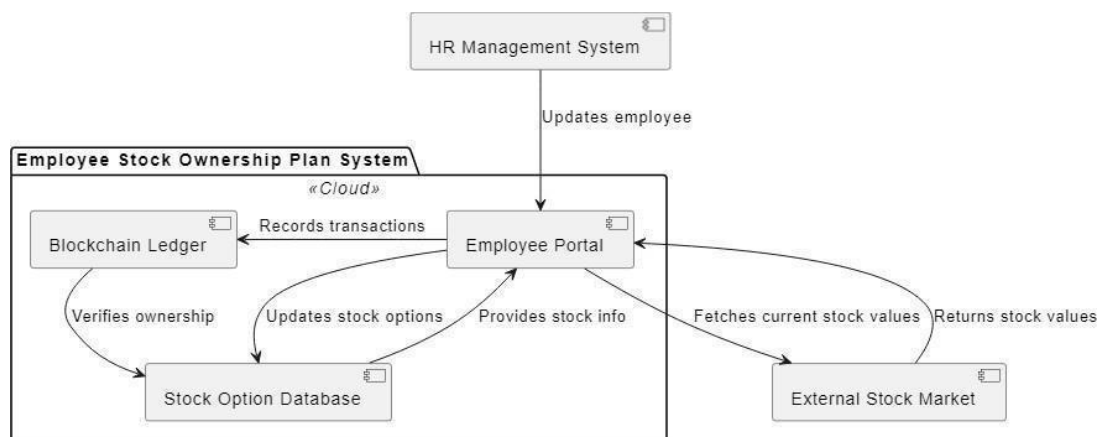

FIGURE 1. Context Diagram

Use Case Diagram

Functions and relationships in the ESOP plan will be shown on the use case diagram that is based on blockchain. The employees, the administrators, the blockchain network nodes and the smart contracts are the possible main participants. Use cases could be opening dividends distribution, allowing employees to vote at business decisions, allocating shares to employees and providing transparent information for owners. Through the visualization, stakeholders perceive the goal of the system, which is to utilize blockchain technology to empower the company's employees through ESOP.
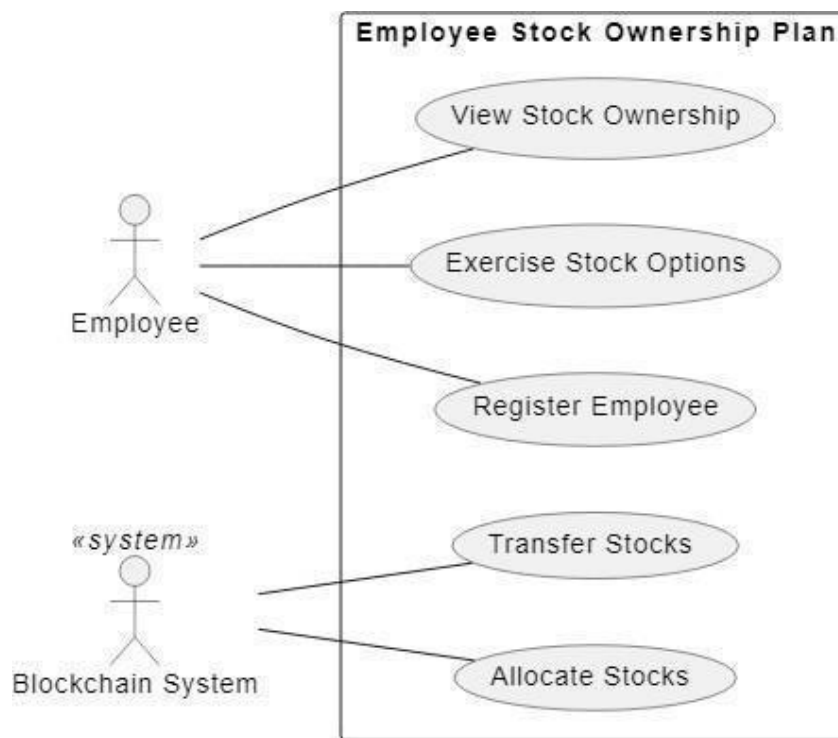
FIGURE 2. Use Case Diagram

RISK ANALYSIS OF THE PROJECT FEASIBILITY STUDY

Exploring the aspects, feasibility and operational capability of a Blockchain Employee Stock Ownership Plan (ESOP) study. Assessing the appropriateness of technology implementation costs, security measures, regulatory compliance and advantages of streamlined stock control. Also examining employee integration, training processes and legal considerations when utilizing a system, for ESOP purposes. Evaluating viability and operational practicality as factors to consider.

Economical Feasibility

The viability of implementing a blockchain based Employee Stock Ownership Plan (ESOP) hinges on weighing the costs against the benefits it brings. Factors to consider include the investment, in technology ongoing maintenance expenses and the potential savings derived from transparency reduced administrative workload and lower risks of fraud. It's crucial to assess the term implications especially focusing on how it impacts employee earnings and the companys financial health. Additionally examining the influence of compliance expenses and market trends on utilizing blockchain in ESOPs is essential.

Operational Feasibility

When evaluating the practicality of a Blockchain based Employee Stock Ownership Plan (ESOP) one must delve into its real world implementation and upkeep. Key considerations include; 1. Integration with Existing Systems; Assess how the blockchain solution aligns, with HR and financial platforms to facilitate smooth operations. 2. User Adoption; Evaluate employees readiness to embrace the system and ensure adequate training

is provided for a transition

SMART CONTRACT ALGORITHM

The algorithm at the core of smart contracts is a sophisticated machinery of the digital processes that are built into blockchain networks. These smart contracts, written in a specialized code like that of Solidity, do not only enclosed conditions and actions but also takes action on conditions, they have been preset. Contractual terms are first carefully written and the operation logic is coded in order to clarify the execution part and to ensure that the algorithm is flawless and precise. Next, deployment to the blockchain network is carried out indicating that the contract has become an immutable entity, that is, it can be accessed by all the network participants. Having been activated, the smart contract will keep checking for triggering events, and the events may be as simple as temporal milestones or as complex as the type of input transactions that are given. The events collide together that can be viewed as the catalysts which start the execution of the contract.

Following this, the verification of conditions is done by the network nodes. The validity and the integrity of the contract's execution are carefully studied using the consensus mechanisms that are built into the blockchain, so that the established protocols are followed and the contract cannot be tampered with. As happens with the execution of the contract, the outcomes of it are recorded indelibly on the blockchain ledger, that is why they are the part of the unchangeable history of the transactions. On the contrary, this being clear and auditable for everyone else, promotes integrity among all the players and builds up confidence and effective accountability and dispute resolution. The important thing about smart contracts is that they eliminate the need for intermediaries, which makes the processes easier and faster and the transactional costs lower while at the same time guarantees the efficiency and safety. Smart contracts surpass the mere automation both in a technical and metaphoricallevels. Actual contracts are redefined. They become intelligent, transparent, autonomous and reliable since their applications on the agreements are supported by cutting-edge technology. Across every field—from the financial market to supply management—smart contracts are transformative by nature,aiding in creation of new avenues for less cost, building trust and creating a sense of community in the age of digitalization

METHODOLOGY

Authentication and Authorization Module:

This module will thus be responsible for the security and privacy of the identities of these employees who belong to the ESOP system and they will be correctly identified. It will grant the user the permission to access the system only in those departments and with those authorities which he or she has in the organization, thus reducing the risk of unauthorized access. Utilizing blockchain technology, employee authentications and authorizations will be securely stored on the distributed ledger, ensuring transparency and accountability.

Stock Management Module:

Here are the functions that will be managed and supervising process of allocation, distribution, and fund transfer of stock options to the employees. Through these contracts, agreements encoded in the chain based on preset parameters. blockchain, stock issuance and ownership changes will be automatically recorded and validated, eliminating manual errors and reducing administrative burden. The employee will have the chance to get access to his stock holdings in an instant and adjust his holdings in a convenient and timely manner for a better performance.

Reporting and Compliance Module:

 It randomly examines ESOP transaction clearing which meet certain requirements and are fair and exact. Blockchain's immutable ledger makes it safe and to audit the trading decisions of the stock market, hence forming an audit trail and simplifying the regulatory process. The module is a combination of the external compliance systems with the corporate systems in real time so that the companies are on the top of the law and corporate requirements. A number of technological procedures and strategic phases are included in the approachused to create and execute blockchain based Employee Stock Ownership Plans (ESOPs) inorder to guarantee the efficiency ,security, and integrity of the system.

The methodology contains the following steps: choosing appropriate blockchain, developing smart contracts, implementing consensus mechanisms, security and easiness of an interface. This begins with picking up a suitable blockchain infrastructure which must fulfil the necessary criteria of the operating business. Therefore, it is about the scalability, security, decentralization, interoperability with smart contracts, and so on. Ethereum, Hyperledger Fabric and EOSIO are the three block platform all over the world that works for a creation of ESOP. Every one of them is different and is applicable for the specific situation. After the selection of a blockchain platform, a smart contract will be written. This is on the basis of ESOPs logics and rules.

The concept of a smart contract is exactly that of a self-executing contract. In this case, they are usually deployed to offer an Automatic element when it comes to an Employment Stock Ownership Plan (ESOP) that usually includes voting rights, issuance of shares, vesting schedule and payout of dividend. Smart contracts of Ethereum (Solidity) or Hyperledger Fabric (Chaincode) can be used to code ESOP transactions. This would not only ensure the auditability, immutability, and transparency of the ESOP platform but also guarantee that no ESOP transaction can be altered or its history be lost. In a nutshell, the adoption of blockchain technology in sharing company equity with employees is expected to change the way these companies operate. Through the use of blockchain's transparency, security, efficiency, and automation, companies can build a more fair and accessible ownership structure that matches the employee's interests with the company's goals. Nevertheless, regulatory concordance and technological assimilation are among the hurdles, but blockchain-based ESOPs will achieve enormous value for the employees and the employers.
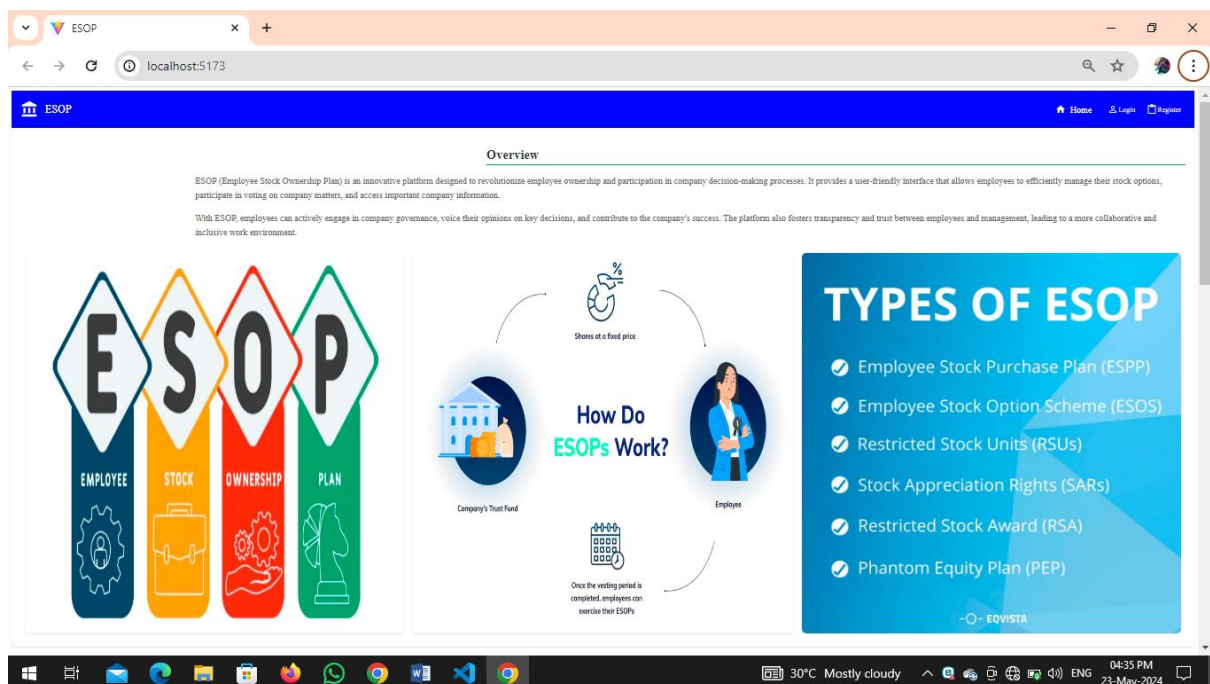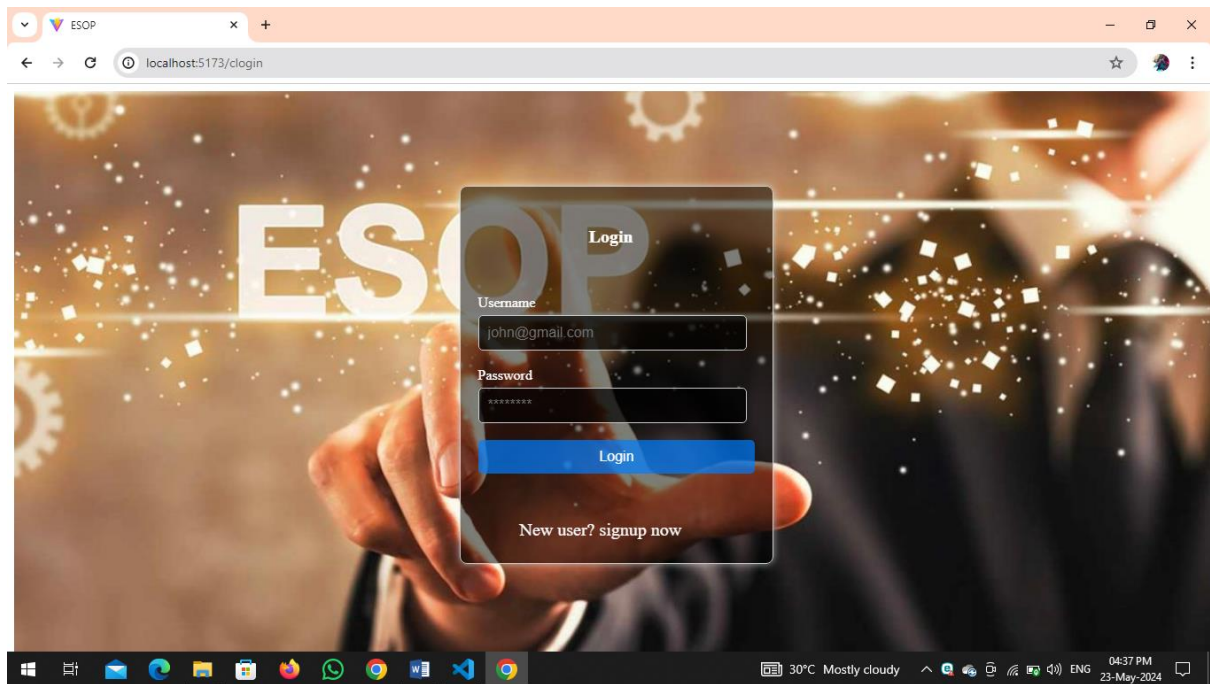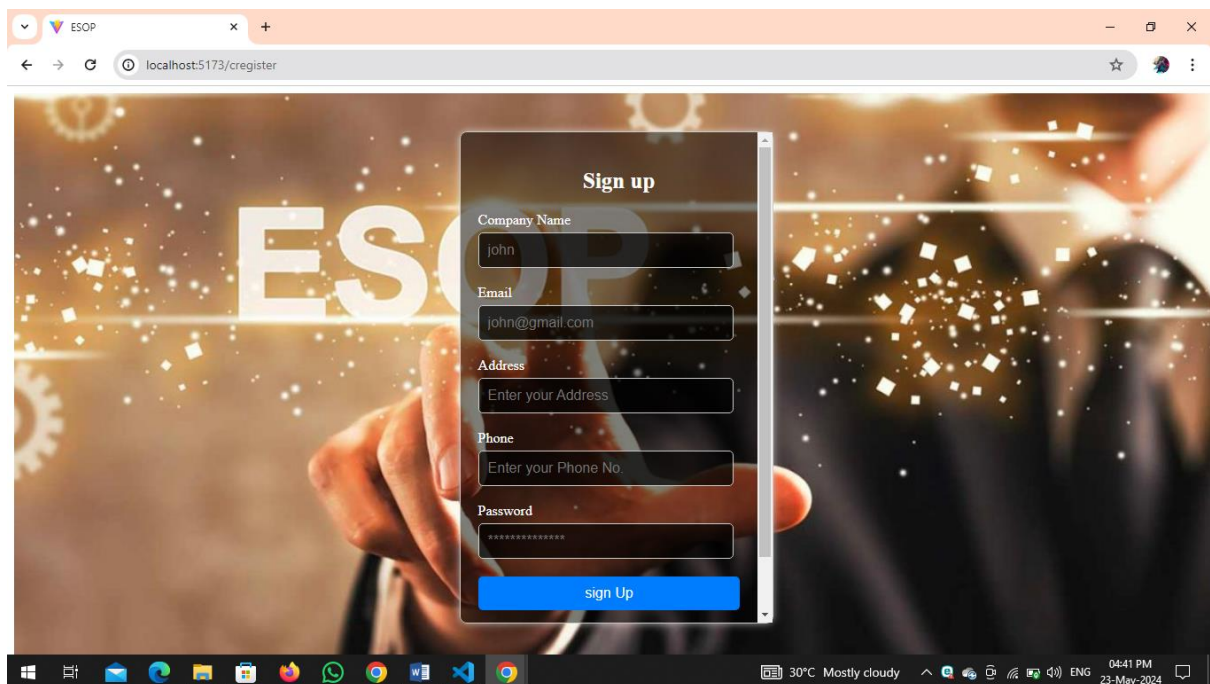
OUTPUT IMAGES

FIGURE 3. Homepage

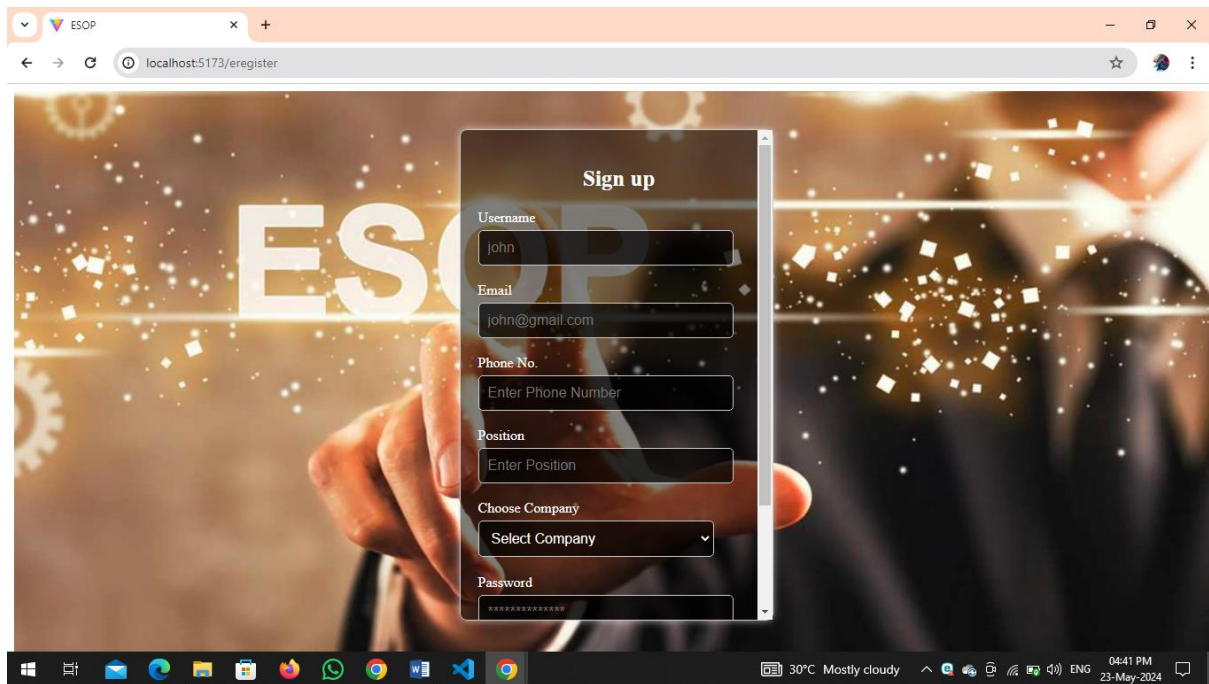**FIGURE 4.** Login Page

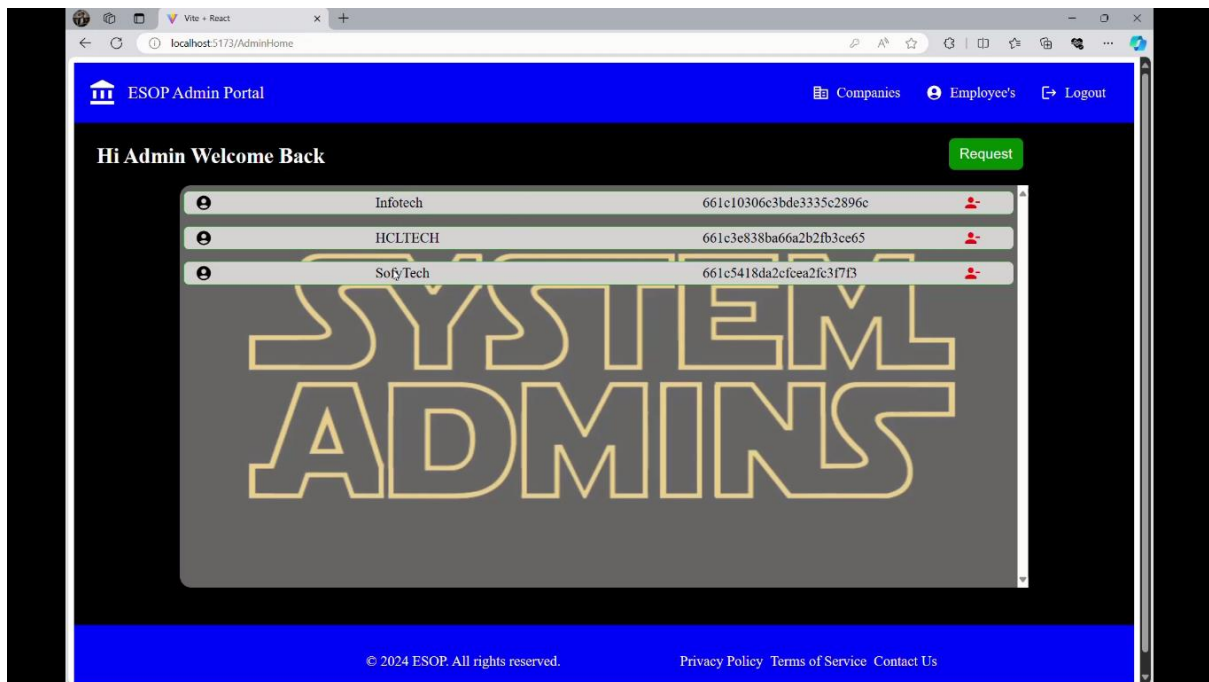**FIGURE 5.** Company Sign In Page

FIGURE 6. Employee Sign Up

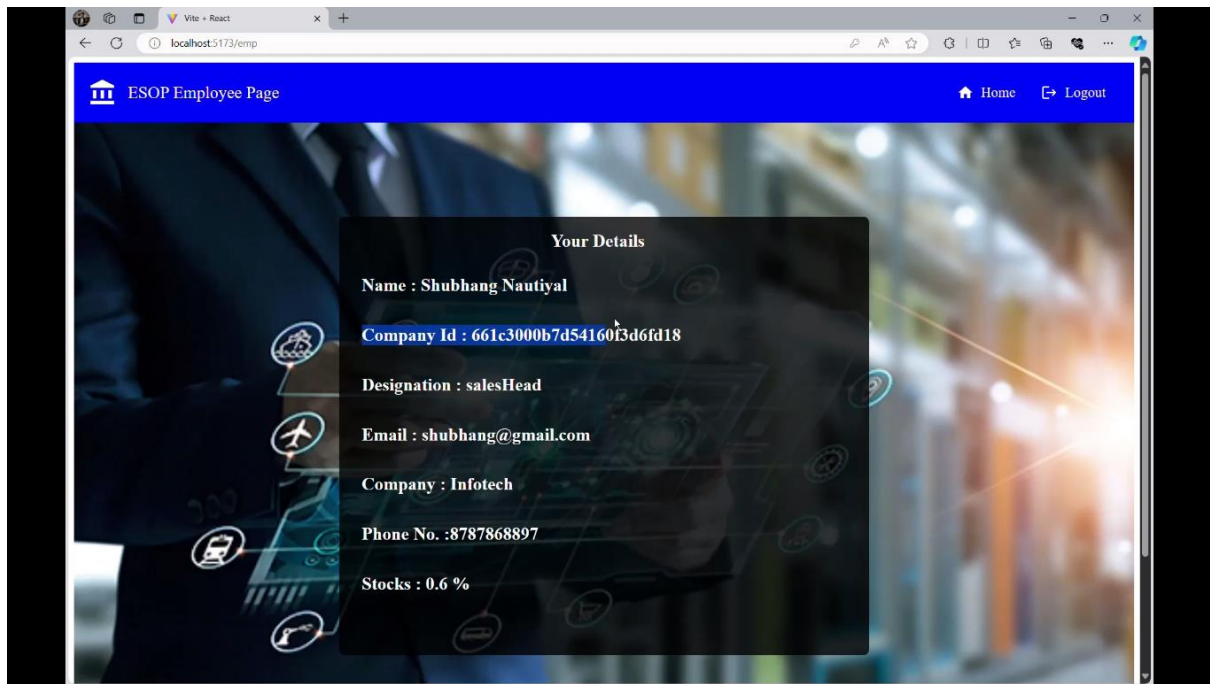

FIGURE 7. Admin Page
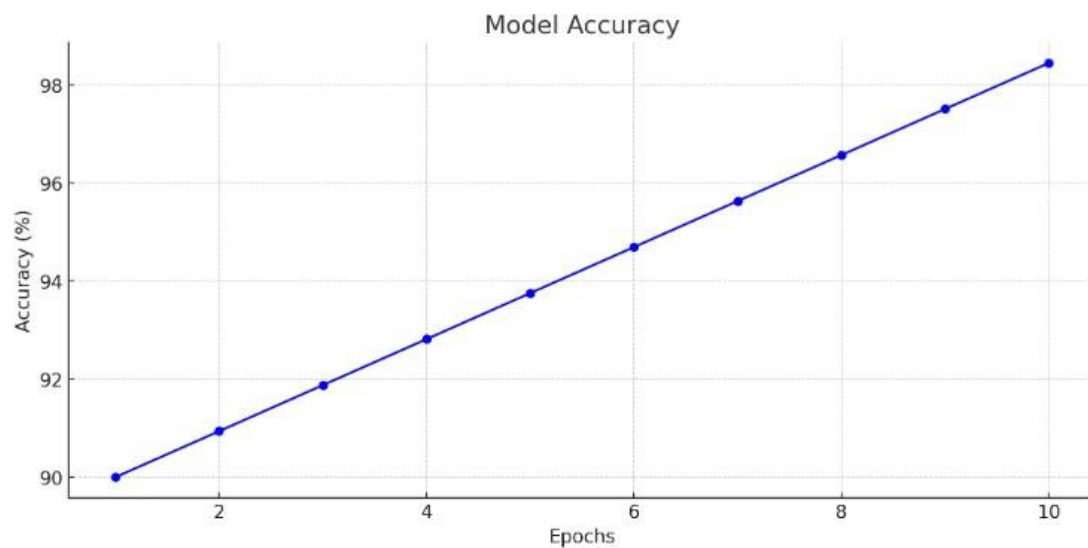
FIGURE 8. Employee Details

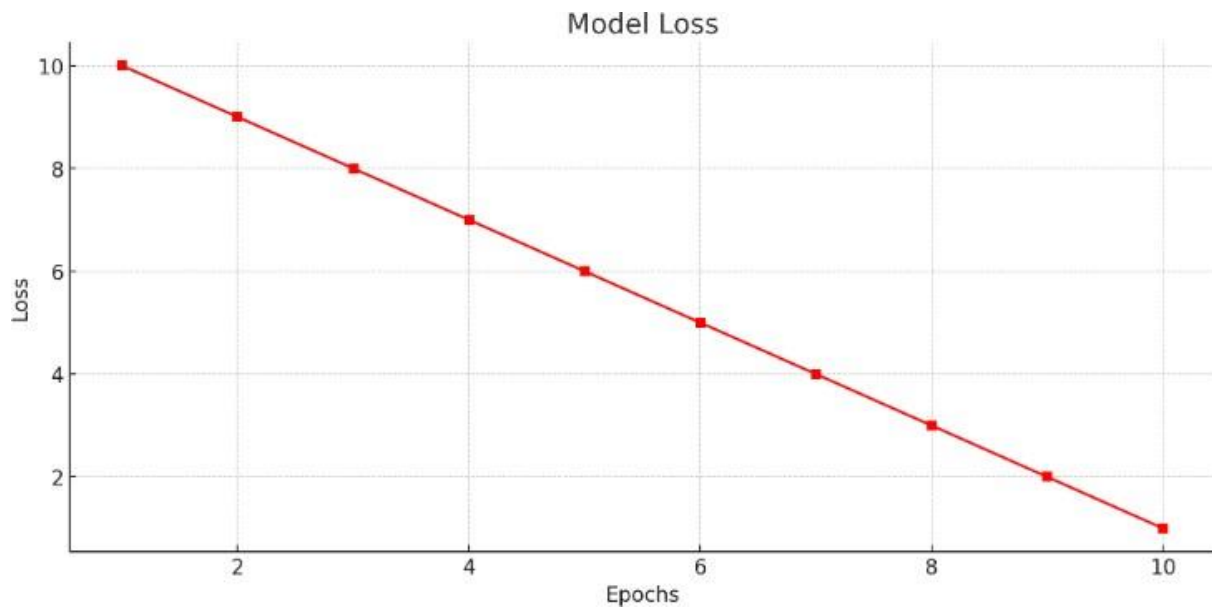# GRAPH

FIGURE 9. Model Profit

FIGURE 10. Model Loss

RESULTS

At the finance sector, the erection of Blockchain technology based stable voting system (ESOP) is a trustworthy and innovative places where the ownership positions are to be gotten by the members of employees. In this ESOP, the blockchain technology is used in an evidence-based way so that all transactions and ownership records are securely recorded on a decentralized ledger which ensures the system is non-tempered and immutable. Employees can access real-time information about their ownerships takes, track the performance of company stocks, and participate in voting processes eamlessly through smart contracts. Hence, getting to trust and transparency among the staff and to the enterprise this way, so that it can get to ownment and to the alignment of interests. Additionally, blockchain technology enables faster and more efficient execution of stock transactions, reducing administrative overhead and ensuring compliance with regulatory requirements. This implies that blockchain technology in ESOP scheme is the shift away from the centralized ownership distribution model to democratic and more transparent ones that are motivating and remunerating to the workers and which ease the work procedures and maximize security.

CONCLUSION

According to the theory, a Blockchain-powered ESOP will introduce a number of blockchain advantages among them are the exquisite transparency, security and efficiency, which would be reason enough to plan or further develop such a system. Through the support of blockchain's distributed ledger system, ESOPs could be handled properly, which makes it possible for reducing administrative costs and as well as being resistant to fraud and error.

Besides the many benefits of blockchain is the increased transparency which it also brings. Every tradethe ESOP, whether it is the issue of new shares, transfer of the shares, and the distribution of dividends, all of them are recorded on the blockchain in a way, which has a certain level of reliability and unchangeability. By doing this, the employees' trust and loyalty to the company gets increased because they can check out and confirm the accuracy of their exact ownership shares and also track the real-time performance of the company.

The blockchain is also a better security system for ESOPs than the usual equity administration systems. Decentralization which is Blockchain's unique identity prevents all the employee data with financial information from being stored in a solitary centralized database that can be targeted and exploit during a cyber attack. Nevertheless, in a contrast with other systems, the account data is stored across the nodes within the blockchain network so as for the hackers to either have access or manipulate the system.

In addition to the blockched-based ESOPs, the management of administrative tasks is another great advantage that smart contracts brings us. Smart contracts are an immutable and inherently programmable structure which is capable of regulating multiple various conditions and functions. While implementing the ESOP, smart contracts will be able to automatically enforce cliffing stages as well as the release of shares upon successful completion of performance objectives, and the seamless transfer of ownership among employees. The automation not only optimizes the administration of the ESOP but it also reduces the chances of errors and ensures compliance with the regulatory requirements.

Moreover, give the opportunity of fractional ownership with the help of blockchain technology which means often employees will have some fraction of the company's equity shares. The operational Ownership model is designed inclusively such that not only those at the managerial level but all employees from within the organization can take part in the ESOP no matter how much resources they are endowed with. Additionally, fractional ownership can amplify employee engagement and commitment to the firm's longevity since they have a direct involvement and a contribution element to the company's effectiveness and profit-sharing.
In this regard, the practically of using blockchain technology to give a stake in the share of company equity to employees would reform the manner in which these companies operate. A transparent, secure, efficient and automated framework offered by the blockchain technology allows companies to create an ownership structure that is more democratic and more in tune with the employees' interests which are, at the same time, a part of the company's goals. However, regulatory harmonization and technology adoption are among the obstacles, but the blockchain-based ESOPs will provide a huge value for the employees and the employers..

FUTURE ENHANCEMENTS

Enhanced Security Features: The system can be strengthened with the implementation of sophisticated security measures including biometric verification, multi-factor authentication, and encrypted communication lines to thwart cyber threats and unlawful access.

Integration with Decentralized Finance (DeFi) Protocols: The integration with DeFi protocols to provide additional functions like automated dividend distribution is also an aspect to be explored.

Enhanced Reporting and Analytics: Integrate reporting capabilities advanced analytic tools to give deeper insights on how much stock does an employee own and how they have performed in the past and this can be used for future decision making. Tokenization of Additional Assets: To add onto the system's tokenization capabilities beyond company stocks on to things like real estate properties, intellectual property rights, or employee performance-based rewards.

Cross-Platform Compatibility: Designing the mobile applications that are compatible with different operating systems (iOS, Android) to enable employees to access their stock ownership details and transaction capabilities on their preferred devices.

Blockchain Interoperability: Implementing interoperability solutions by all blockchain networks to have smooth exchange of tokenized assets and data with every network, giving more room for mass adoption and full interoperability between the various ecosystems. Enhanced Governance Mechanisms: Implementing decentralized governance approaches like DAOs (Decentralized Autonomous Organizations) which will enable stake holders to have their voting power and the ability to make decisions concerning the development processes of the employee stock ownership plan.

Scalability Solutions: Reaching for and carrying out scalability solutions like layer 2 scaling solutions (e. g. The limitation lies in scaling issues such as throughput and transaction delays (sidechains, state channels) or sharding for a growing user base and higher demands.

AI and Machine Learning Integration: Empowering the application of AI and the machine learning algorithms to

optimize purchasing plans, detect fraud in the transactions and offer personalized staffs' recommendations according to their financial goals and risk levels.

RegulatoryComplianceAutomation:The development of tools and smart contracts that can automate regulatory compliance processes such as KYC (Know Your Customer) verification, AML (Anti-Money Laundering) checks and tax reporting requirements can streamline regulatory compliance and reduce administrative burdens.

REFERENCES

1. Onjewu, A. K. E., Walton, N., & Koliousis, I. (2023). Blockchain agency theory. Technological Forecasting and SocialChange, 191, 122482.
2. Aliyev, A. G. (2022). Study of Development Trends and Application Risks of Cryptocurrency and Blockchain Technologiesin the Digital Environment. Informatica Economica, 26(3).
3. Alabdali, A. M. (2022). A novel framework of an IOT-blockchain-based intelligent system. Wireless communications andmobile computing, 2022, 1-13.
4. Kitsantas, T. (2022). Exploring Blockchain Technology and Enterprise Resource Planning System: ESOP | BLOCKCHAINBASED ESOP 9 Business and Technical Aspects, Current Problems, and Future Perspectives. Sustainability, 14(13), 7633.
5. Munoz-Ausecha, C., Gómez, J. E. G., Ruiz-Rosero, J., & Ramirez-Gonzalez, G. (2023). Asset Ownership Transfer andInventory Using RFID UHF TAGS and Ethereum Blockchain NFTs. Electronics, 12(6), 1497.
6. Battah, A., Madine, M., Yaqoob, I., Salah, K., Hasan, H. R., & Jayaraman, R. (2022). Blockchain and NFTs for trustedownership, trading, and access of AI models. IEEE Access, 10, 112230-112249.
7. Chen, K., Fan, Y., & Liao, S. S. (2023). Token Incentives in a Volatile Crypto Market: The Effects of Token Price Volatilityon User Contribution. Journal of Management Information Systems, 40(2), 683-711.
8. Luitel, B. (2023). An Analysis of CPMM Liquidity Pool Dynamics for Employee Liquidation Programs (Doctoraldissertation, The Ohio State University).
9. Nguyen, X. T. (2023). Blockchain Games and a Disruptive Corporate Business Model. Stan. J. Blockchain L. & Pol'y, 6,43.
10. Liu, Z., Li, Y., Min, Q., & Chang, M. (2022). User incentive mechanism in blockchain-based online community: Anempirical study of steemit. Information & Management, 59(7), 103596.
11. Schneider, N. (2020). Broad-based stakeholder ownership in journalism: Co-ops, ESOPs, blockchains. Media IndustriesJournal, 7(2).
12. Xu, J. (2021). The application of blockchain technology in equity incentive. In E3S Web of Conferences (Vol. 235, p.01025). EDP Sciences.
13. Schneider, N. (2021). Broad-based Stakeholder Ownership in Journalism: Esops, Co-ops, Blockchains
14. Zhou, Q., Han, H., & Han, J. (2024). Does employee stock ownership plan have monitoring and incentive effects?--Ananalysis based on the perspective of corporate risk taking. Heliyon, 10(2).
15. Łabędzki, R., Gadomski, P., & Multaniak, P. (2021). Impact of employee stock ownership plans on productivity in videogame companies. WSEAS Transactions on Business and Economics, 18, 1235-1254.