Journal of Artificial Intelligence and Capsule Networks (ISSN: 2582-2012)
www.irojournals.com/aicn/

Blockchain -Enhanced Dynamic Pricing Strategies in Book Redistribution: Balancing Profitability and Fairness

Vinodhini S.[1], Naga Saravana Priyan G M.[2], Hariharan S.[3]

[1]Assistant Professor, Information Technology, Velammal Engineering College, Tamil Nadu, India.

[2,3]Student, Information Technology, Velammal Engineering College, Tamil Nadu, India.

Email: [1]vinodhini@velammal.edu.in, [2]saravana.gm24@gmail.com, [3]hariselva3478@gmail.com

Abstract

Dynamic pricing strategies in book redistribution is an online platform designed for the buying and reselling of second-hand books. The platform employs a dynamic pricing strategy facilitated through direct negotiation between sellers and buyers. By using technologies like React, Node.js, MongoDB, and Express, along with blockchain and smart contracts, its main aim is to balance profitability and fairness in book transactions. Specifically, the platform aims to enhance the efficiency and security of book redistribution processes and prevent fraud, including counterfeit books, to ensure trust in transactions. Each book on the platform is uniquely associated with a blockchain token, effectively mitigating the risks associated with fraud and counterfeit transactions. Smart contracts play a crucial role by enabling secure and transparent monetary transactions between parties involved in buying and selling books. Moreover, the platform fosters fair pricing through direct negotiation and provides a user-friendly interface that supports manual searches and negotiations. By integrating these technologies and functionalities, the platform not only enhances the overall efficiency of book redistribution but also promotes a secure environment that encourages trust and fairness among its users.

Keywords: Online Platform, Resell, Negotiation, Redistribution, Blockchain, Smart Contract

DOI: https://doi.org/10.36548/jaicn.2024.2.008
Received: 10.05.2024, received in revised form: 03.06.2024, accepted: 20.06.2024, published: 01.07.2024

1. Introduction

In the age of digital transformation, where online platforms have revolutionized the way we buy and sell goods, the realm of book redistribution has found its own innovative stride. “Dynamic Pricing Strategies in Book Redistribution: Balancing Profitability and Fairness”, emerges as a pioneering website tailored to facilitate the seamless exchange of second-hand books directly between sellers and buyers. In today's setup, cumbersome middlemen are no longer needed; instead, negotiation is the key way prices are decided. This encourages direct engagement and gives people more control over the transaction process. Utilizing cutting-edge technologies such as React, Node.js, MongoDB, Express, blockchain, and smart contracts, this platform orchestrates a sophisticated yet user-friendly platform, redefining the landscape of online book commerce.

At its core, the platform operates on a simple yet powerful premise sellers post details of their available books, including pertinent information such as title, edition, condition, and desired selling price. On the other end, the buyers can peruse these listings and submit requests for desired books, initiating a dynamic matching process. When a buyer's request matches a seller's book, both are quickly notified, so they can negotiate directly. This personal approach makes buying easier and gives users a stronger sense of control and empowerment. Central to the platform is its use of dynamic pricing strategies. This means negotiations can adjust smoothly to reflect the real value of each book. Instead of fixed prices, the platform uses flexible bargaining to ensure a fair exchange. It aims to balance sellers' profits with buyers' affordability. This focus on negotiation not only improves user satisfaction but also creates a lively marketplace with flexible pricing.

Moreover, the platform integrates blockchain technology [1-2] to enhance security, transparency, and trust in transactions. Each book is tokenized, creating a unique digital asset whose ownership and authenticity are verifiable on the blockchain. This innovation mitigates risks associated with fraud, counterfeit goods, and transactional disputes, instilling confidence and peace of mind in users. Trust plays a crucial role in e-commerce transactions, influencing consumer behavior and perceptions of website credibility. Third-party seals, such as trust indicators, are commonly used to signal trustworthiness and enhance consumer confidence in

online platforms. Online marketplaces rely heavily on trust and reputation mechanisms to foster user trust and confidence.

Trust plays a crucial role in e-commerce transactions, influencing consumer behaviour and perceptions of website credibility. Third-party seals, such as trust indicators, are commonly used to signal trustworthiness and enhance consumer confidence in online platforms. Online marketplaces rely heavily on trust and reputation mechanisms to foster user trust and confidence [3].

Online book-sharing communities offer unique insights into user behaviour and interactions. A study delves into the nuances of user behaviour within these communities, providing valuable insights into user preferences, engagement patterns, and content sharing dynamics, contributing to a deeper understanding of user-centric features and functionalities in online knowledge-sharing platforms. Designing effective online book exchange platforms requires comprehensive guidelines that prioritize user experience and usability. Another research presents design guidelines tailored specifically for online book exchange platforms, drawing upon principles of user-centered design and usability. It offers practical recommendations for creating intuitive and user-friendly platforms that optimize trust, engagement, and satisfaction among users [4,5].

1.1 Existing System

The existing system for online book redistribution lacks a cohesive approach to dynamic pricing and fraud prevention, often relying on fixed pricing models and limited security measures. Most platforms facilitate transactions without direct negotiation between buyers and sellers, leading to inefficiencies and missed opportunities for price optimization. Moreover, fraud and counterfeit goods remain prevalent concerns, as existing systems lack robust mechanisms to authenticate the provenance and authenticity of second-hand books. While some platforms may utilize basic encryption techniques for transaction security, they often fall short in providing comprehensive solutions to mitigate risks and foster trust among users. Overall, the existing system fails to fully leverage emerging technologies such as blockchain and smart contracts to enhance transparency, security, and fairness in the online book redistribution process.

2. Literature Survey

In the realm of e-commerce, trust serves as a cornerstone for user engagement and satisfaction. The researchers delve into the critical aspects of security and privacy considerations in e-commerce platforms, highlighting the importance of implementing robust security measures to protect user data and mitigate risks of fraud and unauthorized access. Their research informs the development of secure and privacy-conscious online book redistribution platforms, ensuring the protection of user information and transactional integrity. A significant portion of the population reads books using diverse methods: buying them outright or borrowing from libraries, which conserves resources. Many readers both purchase and borrow books, often sharing them with a small circle of friends, decentralizing book circulation. However, limited library accessibility underscores the need for efficient resource use. By encouraging book swapping among nearby readers, the authors aim to establish a platform that promotes equitable sharing without extra costs, contributing to a sustainable circular economy [6]. The study [8] explores factors influencing knowledge sharing in virtual professional communities, integrating personal factors like self-efficacy and outcome expectations with environmental factors such as multidimensional trust. Using a Social Cognitive Theory-based model, it employs structural equation modeling and confirmatory factor analysis to validate its hypotheses.

Ray et al [7] proposed a machine learning-based approach for fraud detection in e-commerce transactions. Their research emphasizes the importance of utilizing advanced techniques to identify fraudulent activities effectively, contributing to the development of robust fraud detection systems

Adi et al [9] presented a machine learning approach for detecting online fraud in e-commerce transactions. Their research focuses on leveraging machine learning algorithms to analyze transaction data and identify patterns indicative of fraudulent behaviour, contributing to the development of effective fraud detection systems. weng et al [10] proposed a novel fraud detection model for e-commerce platforms based on artificial intelligence. Their study explores the application of AI techniques in detecting fraudulent activities, offering insights into the development of intelligent fraud detection systems.

Gao et al [11] conducted research on detecting online payment fraud using machine learning techniques. Their study emphasizes the significance of machine learning in identifying fraudulent activities in online payment transactions, contributing to the development of effective fraud detection systems.

Based on the insights gained the proposed work aims to develop an online book distributing platform that reduces the fraudulent activities by following a dynamic strategy for pricing and employing the Blockchain

3. Proposed Work

Building upon the insights garnered from the literature survey, the proposed work aims to develop a comprehensive online book redistribution platform, titled "Dynamic Pricing Strategies in Book Redistribution: Balancing Profitability and Fairness." This platform will serve as a pioneering solution to streamline the exchange of second-hand books while optimizing profitability for sellers and ensuring affordability for buyers. Leveraging cutting-edge technologies including React, Node.js, MongoDB, Express, blockchain, and smart contracts, the platform will offer a user-friendly interface and robust backend infrastructure to facilitate seamless transactions.

The proposed platform is the implementation of dynamic pricing strategies, enabling real-time adjustments based on market dynamics and user preferences. Sellers set their prices, engaging in direct negotiation with buyers to reach agreeable terms, fostering transparency and flexibility. Blockchain technology tokenizes each book, verifying ownership and authenticity, mitigating fraud risks. Smart contracts automate transactions, enhancing efficiency and security. The platform offers detailed book listings for sellers, searchable databases for buyers, and initiates negotiations when interests align. Prioritizing user experience, it features intuitive navigation, responsive design, and robust support. Users access tools for negotiation, fraud prevention, and education on blockchain and smart contracts. This innovative solution addresses challenges in online book redistribution, optimizing efficiency, fairness, and trust, revolutionizing the online book commerce landscape.

The proposed system for book redistribution integrates blockchain technology to enhance security, trust, and efficiency in online book reselling. Through tokenization, each

book is uniquely represented on the blockchain, preventing fraud by ensuring the authenticity and ownership of books. Smart contracts facilitate secure transactions by automating the negotiation process and executing payment transfers once conditions are met, thus minimizing the risk of disputes or fraud. With its decentralized and transparent nature, blockchain fosters trust among buyers and sellers by providing a verifiable record of transactions. By leveraging blockchain's capabilities, the system not only enables seamless buying and selling of second-hand books but also addresses critical challenges such as fraud prevention and transaction security in online book markets.

The tokenization is implemented with the help of blockchain where the Ethereum network is used in it. The ethers.js is used to interact with the Ethereum network and to develop the smart contracts. The ethers.js is used from the node.js to interact with the Ethereum network. In this the smart contracts defines the non-fungible tokens(NFTs) with standards which is used as token for the books. These NFTs has unique ids. These token ids are stored in MongoDB with the corresponding book data. Along with the smart contract, functions for querying book tokens, minting new tokens, and transferring tokens are defined. Event logs and a blockchain explorer are used to provide transparency in token transactions.

3.1 System Design

The proposed system design for "Dynamic Pricing Strategies in Book Redistribution" encompasses a user-friendly online platform developed using React for frontend, Node.js and Express for backend, and MongoDB for database storage. The system architecture diagram illustrates the flow of information between components, including user interaction, negotiation, blockchain integration, and transaction processing. Sellers post book listings with details, while buyers submit requests, initiating negotiation. Blockchain technology is utilized to tokenize books, ensuring authenticity and reducing fraud. Smart contracts facilitate secure and automated financial transactions.

The platform features a responsive interface, intuitive navigation, and robust customer support, enhancing user experience. Through dynamic pricing strategies, negotiation mechanisms, and blockchain integration, the system aims to optimize efficiency, fairness, and trust in the online book redistribution process, revolutionizing the landscape of literary commerce.

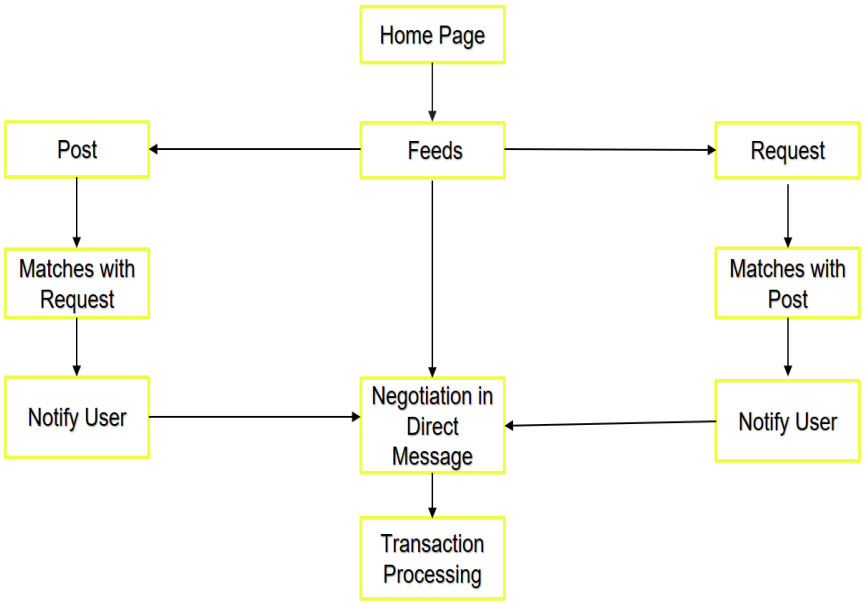

Figure 1. System Design

In Figure 1: system design, once the user signup the website home page will show the feeds. If the seller wants to sell the book, then seller click the post option so that the user can post on the website. If the buyer wants a book, then he enters the book details in the buy form. If the request of the buyer match with the seller, then both the user can negotiate directly in the direct message option

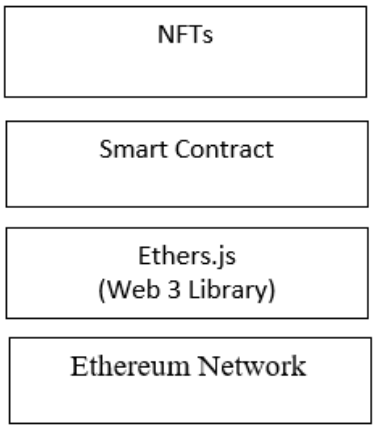

Figure 2. Technical Stack

In Figure 2, shows the technical stack that combines various technology and tools to implement the blockchain. In the blockchain technology the Ethereum network in which ethers.js is use used for creating the smart contracts and digital tokens which is known as the

non-Fungible Tokens (NFTs) for each book. The type of token used is digital identity which are unique identifiers. The ethers.js is implemented within the node.js environment to make the web application interact with the Ethereum blockchain.

4. Experimental Results

The website was developed using a comprehensive technical stack to implement dynamic pricing strategies for book redistribution. React was employed for frontend development, creating user interfaces that facilitated seamless interaction between buyers and sellers. These interfaces featured detailed book listings with pricing dynamically adjusted based on negotiation outcomes. Integration with the Ethereum blockchain utilized Ether.js (Web3 library), enabling secure connections to Ethereum wallets (MetaMask) for interacting with Non-Fungible Tokens (NFTs) linked to each book. This integration verified NFT authenticity, displayed ownership details, and tracked transaction histories.

On the backend, Node.js and Express powered RESTful APIs handling user authentication, book listings, negotiations, and transactions. These APIs seamlessly interacted with the Ethereum blockchain, performing tasks such as minting new NFTs upon listing and ensuring secure token transfers. Smart contracts, coded in Solidity, managed NFT behaviours and transaction logic, deployed on Ethereum and integrated with the backend via Web3.js or Ether.js. MongoDB served as the database, securely storing user profiles, book data, and transaction histories while maintaining data integrity.

Smart contracts included functions for token minting, ownership transfer, and payment management, ensuring transparency and security in transactions. Real-time updates on transaction statuses and application states, supporting the platform's goal of enhancing book redistribution through blockchain-driven dynamic pricing strategies were achieved by integrating the backend API and front-end interfaces.

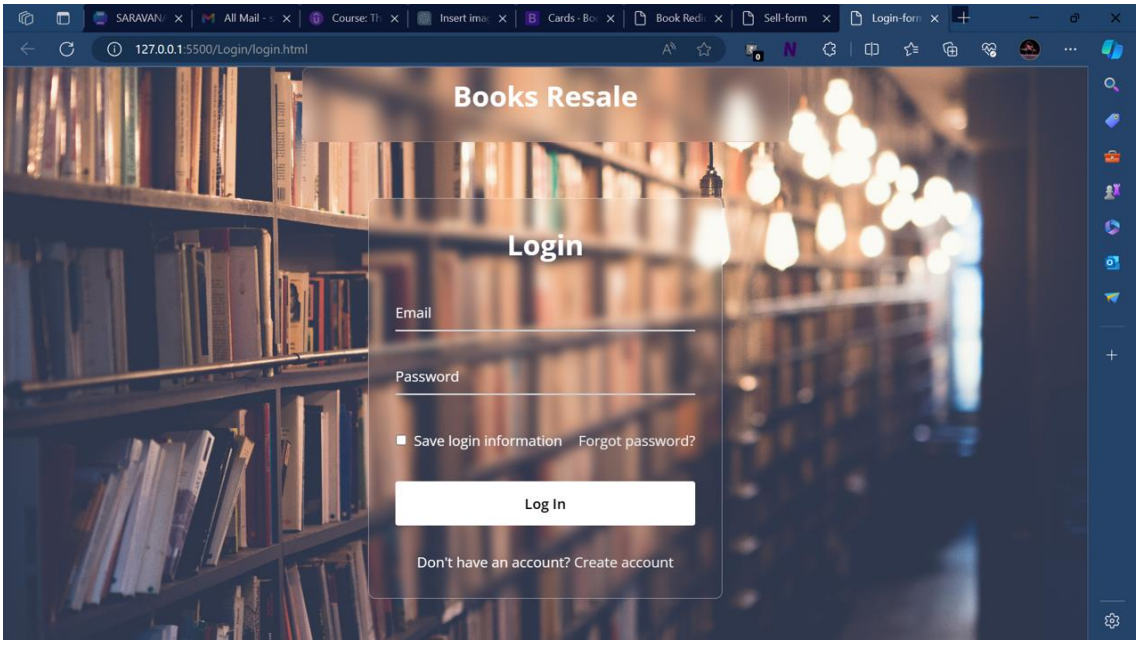

Figure 3. Login Page

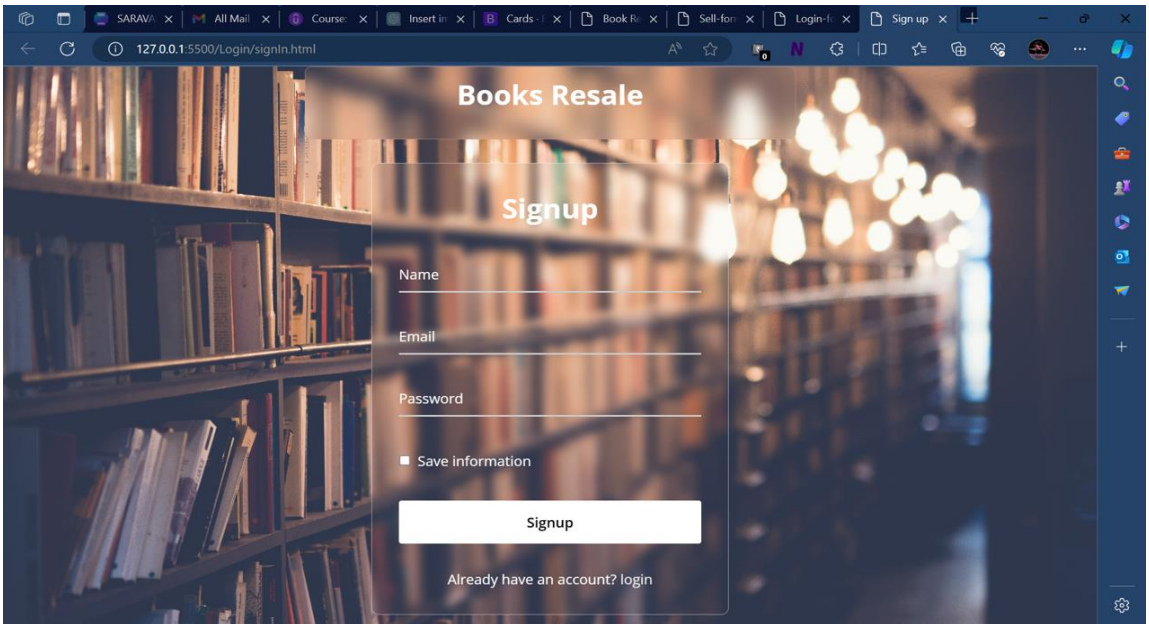

Figure 4. Signup Page

In Figure 3, 4, the login page allows registered users to access their accounts by entering their credentials, ensuring secure authentication and personalized user experience. The signup page enables new users to create accounts, providing access to features like book listings, negotiations, and transactions within the platform.

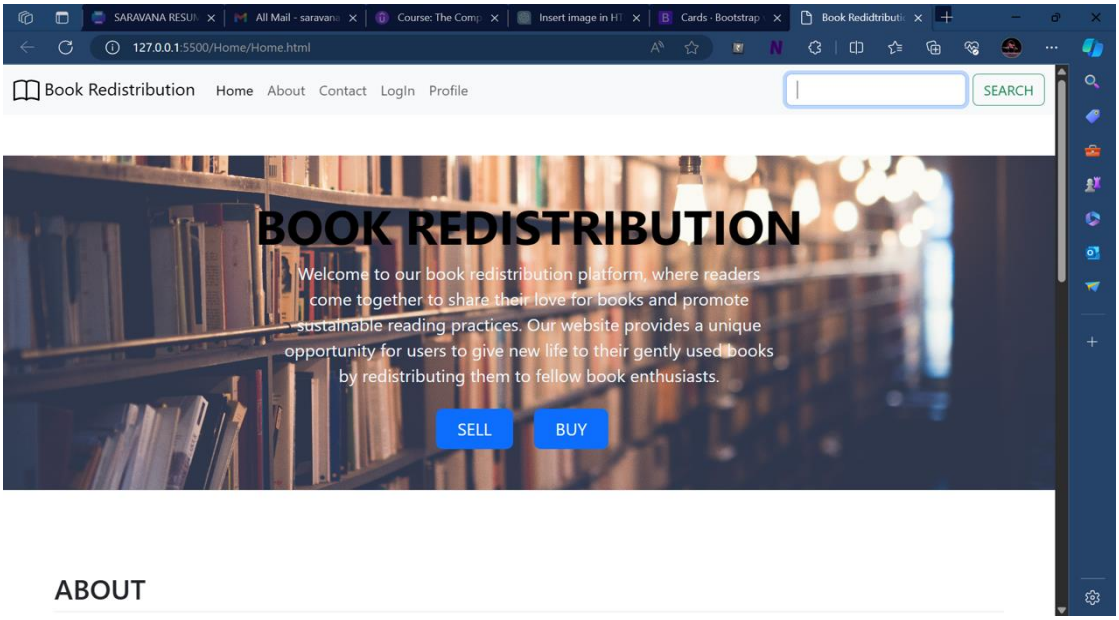

Figure 5. Home Page

In Figure 5, the home page of our website "Dynamic Pricing Strategies in Book Redistribution" welcomes users with a user-friendly interface showcasing a diverse range of second-hand books available for purchase. It highlights the platform's unique features such as dynamic pricing, direct negotiation options, blockchain-enabled authenticity, and smart contract-driven transactions. Users can easily navigate through listings, submit book requests, and engage in secure transactions, fostering a seamless and trustworthy online book commerce experience. The home page shows various option like about, contact, profile, sell and buy. Sell option is to post that the book is available and the buy option is to request to buy the book from the seller. Profile is to provide the information to contact the user.

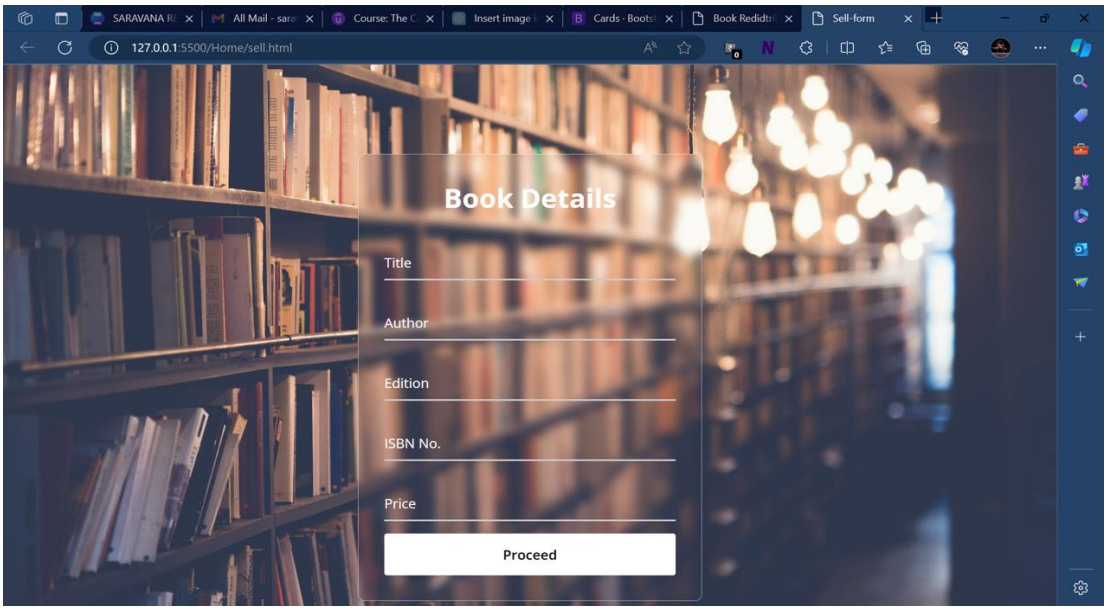

Figure 6. Book Information

In Figure 6, users share book details to match buyer requests with seller offerings. Sellers input information such as title, edition, condition, and desired price for their books. Buyers can then search for desired titles and submit requests. When a request aligns with a seller's listing, both parties are notified, initiating negotiation. This process ensures efficient matching of buyers and sellers, facilitating seamless transactions within the platform's book redistribution ecosystem.

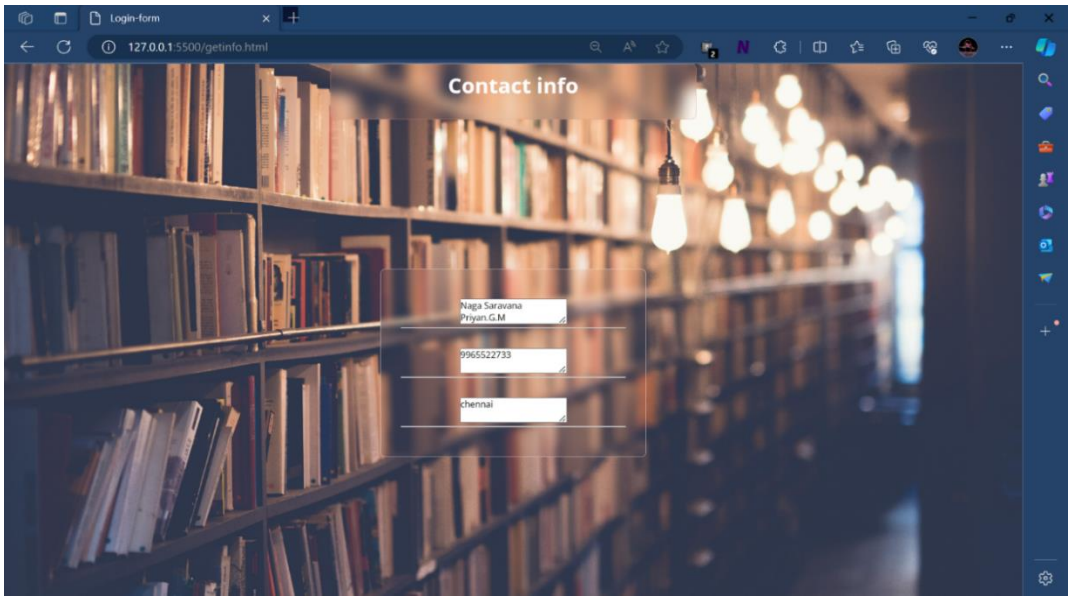

Figure 7. Result Page

In Figure 7, upon matching a buyer's request with a seller, the platform reveals the seller's information to the buyer, facilitating negotiation. This step enables direct communication between the parties to reach mutually agreeable terms. By providing seller details, such as contact information or ratings, buyers can make informed decisions and negotiate effectively. This process enhances transparency and fosters a dynamic exchange, ensuring a personalized and satisfactory transaction experience for both parties.

5. Comparison Chart

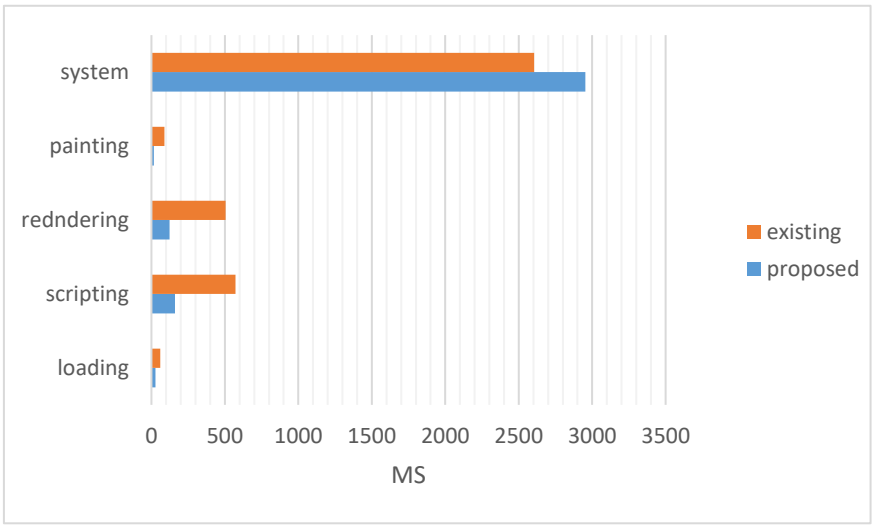

Figure 8. Comparison Chart

In Figure. 8, the comparison between the frequencies of certain actions across two systems is depicted. In the proposed system, loading occurs 27 times, scripting 160 times, rendering 123 times, painting 16 times, and system appearances total 2953. Conversely, in the existing system, loading happens 61 times, scripting 573 times, rendering 505 times, painting 89 times, and system appearances total 2606. These figures illustrate the differing emphasis or prevalence of these actions within each system, providing insight into their thematic or technical focus. The disparity in frequencies highlights potential differences in narrative style, subject matter, or technical content between the two systems. Moreover, these metrics provide insights into how blockchain integration enhances transactional transparency, security, and user engagement, essential for fostering trust in book transactions and ensuring operational efficiency in dynamic pricing strategies.

6. Conclusion

Dynamic pricing strategies in book redistribution is an attempt to overcome the issues in efficiency, fairness and trust in book redistribution by initiating the direct negotiation between buyer and seller. The user-friendly interface facilitates seamless interaction among users, initiating transparent negotiations and ensuring fair pricing practices. The platform addresses the dynamic pricing, fraud prevention, and transactional security. The integration of blockchain enhance the security, verification of ownership, and book authenticity. Blockchain technology add a security by verifying the authenticity of the book which will reduces the frauds and counterfeit books. This not only reduces the frauds but also increases the trust and confidence of the users. The user-friendly approach leads to satisfying online book redistribution experience.

References

[1] Nalayini, C. M., P. Vimala Imogen, and J. M. Sahana. "A Study on Digital Signature in Blockchain Technology." In 2023 Third International Conference on Artificial Intelligence and Smart Energy (ICAIS), pp. 398-403. IEEE, 2023.

[2] Zhang, Xuming, Xiao Zhang, and Rende Li. "A blockchain enhanced book lending system for college library." In The 2022 4th International Conference on Blockchain Technology, pp. 160-165. 2022.

[3] Wanga, Jie, Qiuying Zhanga, and Wen Huanga. "A study of dynamic pricing strategies for cooperation between cruise lines and travel agencies." In ICBBEM 2023: Proceedings of the 2nd International Conference on Bigdata Blockchain and Economy Management, ICBBEM 2023, May 19–21, 2023, Hangzhou, China, p. 321. European Alliance for Innovation, 2023.

[4] Cheung, Christy MK, Matthew KO Lee, and Zach WY Lee. "Understanding the continuance intention of knowledge sharing in online communities of practice through the post-knowledge-sharing evaluation processes." Journal of the American Society for Information Science and Technology 64, no. 7 (2013): 1357-1374.

[5] Cliff, Dave. “An Open-Source Limit-Order-Book Exchange for Teaching and Research.” 2018 IEEE Symposium Series on Computational Intelligence (SSCI) (2018): 1853-1860.

[6] Sudharson, K., Ashwin Prasad, and S. Smriti. "A Survey on Reader's Society: New Social Network of Book Swapping Platform." In 2023 IEEE International Students' Conference on Electrical, Electronics and Computer Science (SCEECS), pp. 1-6. IEEE, 2023.

[7] Ray, Samrat. "Fraud detection in e-Commerce using machine learning." BOHR International Journal of Advances in Management Research 1, no. 1 (2022).

[8] Hsu, Meng-Hsiang, Teresa L. Ju, Chia-Hui Yen, and Chun-Ming Chang. "Knowledge sharing behavior in virtual communities: The relationship between trust, self-efficacy, and outcome expectations." International journal of human-computer studies 65, no. 2 (2007): 153-169.

[9] Saputra, Adi. "Fraud detection using machine learning in e-commerce." International Journal of Advanced Computer Science and Applications 10, no. 9 (2019).

[10] Weng, Haiqin, Shouling Ji, Fuzheng Duan, Zhao Li, Jianhai Chen, Qinming He, and Ting Wang. "Cats: cross-platform e-commerce fraud detection." In 2019 ieee 35th international conference on data engineering (icde), pp. 1874-1885. IEEE, 2019.

[11] Gao, Xinxin "Detecting online payment fraud using machine learning techniques." Journal of Ambient Intelligence and Humanized Computing, Vol. 11, No. 6, 2020.