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INVESTRO – A Scalable Web based Application for Investor and Entrepreneurship Funding Collaboration

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Abstract
Rapid growth in startups and digital entrepreneurship necessitates the development of efficient systems that would foster collaboration in terms of raising funding. Despite this, most startups continue to struggle with finding the right investors due to fragmentation in communication, low accessibility, lack of transparency, and poor networking opportunities. In this regard, this research presents INVESTRO, a scalable web-based system that serves to address the communication gap between investors and entrepreneurs by creating a digital ecosystem. The main purpose of this system is to provide a secure and efficient environment where entrepreneurs are able to publish their startup proposals and allow investors to discover suitable business opportunities via intelligent search and filter functionalities. For the purpose of developing the proposed platform, React.js framework was used to implement the front end, while Node.js and Express.js frameworks were used to develop back end functionality and APIs. As for database, PostgreSQL (Neon DB) was selected. Some of the key features of the system include role-based authentication, proposal management, profile verification, and premium subscriptions. Experimental implementation and testing have shown that the proposed system works efficiently to improve visibility of startups, minimize communication delay, engage more investors, and simplify proposal evaluation processes. The suggested solution facilitates the process of digital transformation of startup funding environments through increasing accessibility, scalability, and efficiency of collaboration as well as offering a reliable platform for innovation-led business growth.

Keywords: *Collaboration platform; Digital entrepreneurship; Investor funding; Startup ecosystem; Web application*

1. Introduction
Entrepreneurship has become one of the major contributors towards economic development, innovation, employment generation, and technological advancement across the globe. The rise in popularity of startup ecosystems and digital transformation initiatives has pushed the entrepreneurs to innovate and scale their businesses. The government initiatives such as Startup India and Digital India have fueled the entrepreneurial activity as well as the technology-based business model. However, one of the biggest issues faced by startups is their inability to raise funds from suitable investors in the early stages of business operation. [1][10]. The conventional approach towards startup funding relies heavily on venture capital meetups, startup fairs, incubator programs, and personal networks. This method of startup funding is very time-consuming, expensive, and unaffordable to smaller entrepreneurs and students who come from poorer economic backgrounds. In addition, the investors face the issue of identifying reliable startups because the information regarding startups is available in a fragmented manner on different platforms, but it is not in a structured format in the form of proposals. There are several other issues associated with the existing model of startup funding which include lack of transparency, accessibility, and communication. Innovations within the domain of digital technologies have led to the creation of several web platforms for fundraising startups and working with entrepreneurs. Within the domain of digital investment ecosystems, it has been seen that web platforms play an important role in providing better access and investments into startups. Verma and Srinivasan explored the

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development of digital investment platforms post pandemic situation and emphasized on the need for online investment ecosystems in this process. Singh and Mehta investigated the case of blockchain investment systems and showed how decentralized technologies can improve the reliability of digital investment platforms. [1][2]. There have been several studies in the domain of web-based entrepreneur support systems and scalable startup collaboration systems. Shah and Patel highlighted some of the issues faced by current entrepreneur support systems, such as scalability issues, poor filtering mechanism, and lack of interaction mechanisms. Khanna and Agarwal explored different types of investor-startup interaction models and emphasized the need for intelligent filtering and recommendation mechanisms. Banerjee and Joseph investigated the problem of automated funding discovery systems and highlighted the need for scalable and reliable data management systems in startup ecosystems. [3][4][5] Modern web technologies such as React.js, Node.js, and cloud-based database have enabled the development of scalable and responsive business collaboration apps. Gupta and Sharma explored scalable web architectures for startups and the necessity of building modular architecture for entrepreneurship platform at a large scale. Roy and Das explored cloud-based collaboration systems and highlighted the importance of cloud-based collaboration systems in enhancing accessibility and digital communication among business entities. Kumar and Iyer explored the concept of secure authentication techniques for web applications and highlighted the significance of role-based security technique in protecting user data. Williams and Brown explored modern React.js and Node.js architectures for web applications and discussed their success in developing scalable enterprise systems. [6][7][8][9]. While there are many digital funding platforms, existing solutions suffer from several limitations such as ineffective communication techniques, high cost, poor transparency, poor scalability, and the absence of intelligent searching and filtering capabilities. Several platforms provide listing capabilities for proposals alone without any functionality associated with proposal evaluation, verification, and collaboration. This indicates the need for the development of a scalable, centralized digital ecosystem that facilitates entrepreneur-investor interaction in an efficient manner. [2][3][5]. In order to overcome these shortcomings, this research introduces INVESTRO, a scalable web platform for facilitating collaboration between investors and entrepreneurs in raising funds. The proposed system allows entrepreneurs to post comprehensive business plans while providing investors with capabilities to search through and analyze various business opportunities depending on their investment interests, type of businesses, required investments, and geographic location. The system incorporates authentication based on roles, profile verification, structured proposal management, intelligent filtering techniques, and premium services via subscriptions. The novelty of the proposed research can be attributed to the combination of scalable web technologies, secure authentication methods, intelligent filters, and proposal management system in one startup collaboration platform. [4][6][8]. The rest of the paper is dedicated to the methodology, system architecture, implementation, experimental analysis, benefits, applications, and future enhancements of the proposed INVESTRO system.

2. Literature Review

There has been much interest in digital investment platforms owing to the quick growth of startup ecosystems and online entrepreneurship in recent times. Verma and Srinivasan studied the development of digital investment platforms post-COVID-19 and pointed out the rising significance of web-based investment platforms in enhancing the accessibility of startups and investor participation. In their analysis, they stressed the importance of online investment ecosystems in making the process of discovering startups easy and overcoming geographical limitations. Likewise, Singh and Mehta examined the use of blockchain technology in investment platforms and explained the benefits of using decentralized technology in enhancing transparency, security, and trustworthiness in startup financing. Nevertheless, they found that implementation challenges and infrastructure costs were major limitations [1,2]. Several researchers have focused their attention on analyzing the various

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support systems for entrepreneurs as well as collaborative models for investors and startups. Shah and Patel have researched on the web-based entrepreneur support system and found issues such as non-scalability, absence of filtering, and interaction problems among others in the current system. Khanna and Agarwal also analyzed the collaborative model between the investor and startup and found that there was a need for intelligent recommendation and filtering systems that enhance interaction between the two. Banerjee and Joseph analyzed automated funding discovery systems and found that there is a need for scalable backend systems and efficient data management systems to handle the needs of larger startup ecosystems [3,4,5]. The development of business collaboration systems has also been enhanced by advances in modern web technologies and scalable application architectures. In this regard, Gupta and Sharma talked about scalable web architectures for startup ecosystems and underscored the need for modularity in systems design to allow for scalability in entrepreneurial applications. Similarly, Roy and Das investigated cloud-based entrepreneurial collaboration platforms and proved their ability to enhance accessibility and efficiency in communication. On their part, Kumar and Iyer focused on secure authentication schemes for web applications and the importance of role-based access control in securing user information. Finally, Williams and Brown looked at the benefits of modern React.js and Node.js architectures for enterprise applications and found out that they are efficient when it comes to scalability and responsiveness. The above research works have laid the technological basis for the development of INVESTRO platform. [6,7,8,9]

3. Proposed Method

INVESTRO web application was created using multi-tiered web application architecture having frontend, backend, API and database tiers. Requirement analysis, system design, implementation, testing and deployment were the various phases of development. Requirement analysis was done to determine the functional requirements for both entrepreneurs and investors such as submitting startup proposals, browsing by investors, security through authentication and profile management. Using these requirements, an architecture as well as database schema was designed in order to enable efficient cooperation among startups. Various web application development approaches used in previous researches were taken into account during the system design phase. The React.js library was used for constructing the frontend part of the application in order to develop responsive and interactive interfaces for registration, login, startup proposal submission, investor dashboard, and browsing startup proposals. The Node.js and Express.js libraries were used for creating backend services responsible for processing API requests, authentication, business logic processing, and communication between application parts. The RESTful APIs were developed for user authentication, startup proposal handling, searching, and profile management. The PostgreSQL database management system along with the Neon DB cloud service was used for managing databases in a structured manner. Secure role-based authentication and validation mechanisms were implemented in order to protect sensitive user data through authorized access. Secure authentication approaches and scalable web architectures similarly to those described in other research works were implemented during the development process. The testing and validation of the proposed system were conducted using Postman and manual functional testing methods. The request handling, authentication, response validation, and error handling of API endpoints were tested. The processes related to submission of startup proposals, filtering processes, and database interactions were tested to ensure reliability and consistency of the system. The search and filtering algorithms were tested on the basis of their ability to fetch startup proposals as per preferences of investors such as the type of business, investment amount, and geographic location.As shown in Figure 1 System Architecture

3.1.Tables

Table 1 Technologies and Methods Used

Phase	Method / Technology
Analysis	Requirement Study
Design	Architecture

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Frontend	React.js
Backend	Node.js
Framework	Express.js
Database	PostgreSQL
Security	Authentication
Communication	REST API
Testing	Postman
Deployment	Cloud Hosting
Future Scope	AI Integration

3.2.Figures

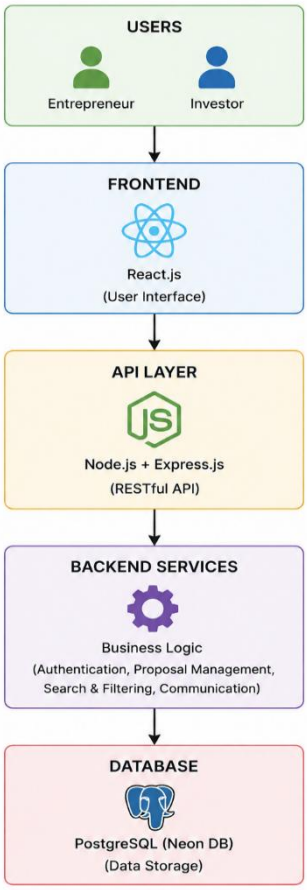

Figure 1 System Architecture

4. Results And Discussion

4.1.Results

The designed INVESTRO platform was successfully launched and tested in order to evaluate its performance in terms of facilitating cooperation between investors and entrepreneurs as well as performing investment operations. The experimental evaluation included testing the main modules of the platform, including user registration, authentication, startup proposal submission, browsing, filtering and database management. It turned out that the system operates stably and communicates efficiently between its frontend and backend parts. Concerning frontend development, React.js technologies have been applied in order to provide responsive navigation and interaction within the key modules, which include login, registration, proposal submission and investor dashboard. Backend modules implemented using Node.js and Express.js were efficient enough in processing users' requests, validating authentication and managing proposals as well as interacting with database. Testing the backend APIs with the use of Postman made it possible to verify request processing efficiency and response generation.The proposal filtering module enabled receiving startup proposals according to the investors' requirements concerning the type of business, investment amount and geographic location. The operations performed using PostgreSQL (Neon DB) technology ensured stable storage and retrieval of users' profiles, startup proposals and investments data. Role-based authentication made it possible to distinguish entrepreneurs' and investors' privileges.

4.2.Discussion

The experiment results showed that the proposed INVESTRO platform is effective in facilitating collaboration between investors and entrepreneurs through a scalable digital ecosystem. The use of structured proposal management, intelligent filtering mechanisms, and role-based authentication allowed overcoming many shortcomings characteristic of conventional startup funding systems. The responsive frontend made possible using React.js and scalable backend with Node.js and Express.js ensured proper communication between application modules and efficient handling of user requests. Filtering and proposal management features were crucial in decreasing the effort required from investors to find good startup opportunities and increased their visibility. [1][4][6] The design also proved the necessity of using secure authentication and profile verification in order to build trust and increase transparency within digital funding ecosystems. The modularity of the designed platform allows further integration of emerging technologies such as artificial

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intelligence, blockchain verification, and predictive analytics to enhance recommendation accuracy and transactions security. Although the present platform is mainly oriented towards startup proposal management and investor collaboration, the possibility of adding features like automatic startup evaluation and real-time communication tools should not be excluded in the future. Overall, the designed INVESTRO platform serves as a good technological basis for creating modern startup funding ecosystems. [2][5][8][10] Shown in Figure 2 Overall Outcome

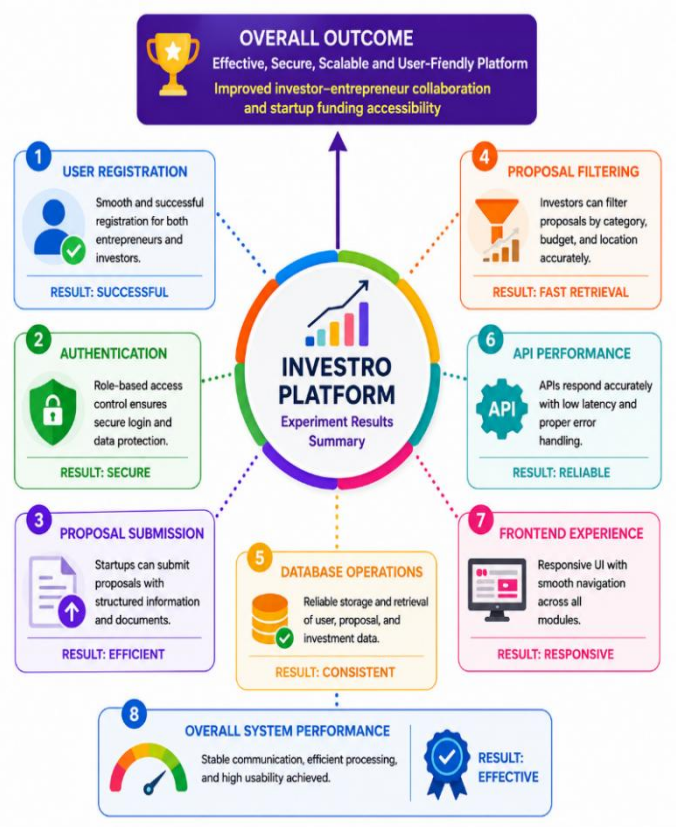

Figure 2 Overall Outcome

Conclusion

INVESTRO, which is a revolutionary, scalable web-based system aimed at facilitating cooperation between investors and entrepreneurs in the start-up financing industry, was introduced in this paper. The suggested solution effectively incorporates secure user authentication, efficient proposal handling, intelligent filtering and scalable web technologies to improve the accessibility, transparency and efficiency of the communication process. Experiments have shown that the suggested solution can facilitate visibility of start-ups and ease the investment process. In addition, the modularity of the architecture of the system allows integrating emerging technologies such as artificial intelligence and blockchain.

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