Career Craft (A Student Training and Freelancing Platform)

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Abstract

As the world continues to rely on technology in all aspects of life, the demand for Information Technology graduates with sufficient background knowledge and necessary practical skills has never been higher. Computer science students are required to keep track of advancements and new trends in the field while maintaining good depth in present technologies. Unfortunately, many fresh graduates face significant challenges when entering the workforce, lacking practical experience and technical skills in the field. To mitigate this problem, students need more exposure to real-world experience and work in a job market environment. This paper presents the design and implementation of Career Craft, a platform that intends to enhance students' programming and problem-solving skills by providing programming tasks that students compete to solve. Teachers develop and publish programing tasks and students solve them in order to gain points. A teacher is assigned as project manager and selects a group of students based on expertise and experience to develop the requested service. This exposes students to the real-world job environment and provides them with hands-on freelancing experience in these areas. By using the system, students can increase their employability by working as freelancers for clients. The system improves students' skills, increases their chances of employment, and increases their income, while helping clients obtain quality services.

Keywords: Career Craft, Freelancing, Training Platform, Programing Skills, UI/UX, Web Development.

1. Introduction

The field of web development has seen significant growth in recent years, as businesses and organizations increasingly recognize the importance of having a strong online presence. This has led to a high demand for professionals with skills in areas such as User Interface/User Experience (UI/UX) design, web development, and web security. In response to this issue, many universities have begun to offer experiential learning opportunities, such as internships and co-op programs, in which students can apply their knowledge in real-world settings and gain practical experience. However, these opportunities can be limited and often only available to a few students, leaving many others without the hands-on training they need to succeed in the workforce.

Information Technology (IT) students suffer from insufficient practical skills due to limited time in laboratories and lack of motive. They are also unaware of issues related to market needs and job requirements. There is a gap between academic knowledge and professional skills that students need after graduation. Different skills that students acquire during their years of study do not fulfill the capabilities that employers expect. Moreover, IT fresh graduates are sought after in the market and considered valuable assets for companies. Therefore they have limited time to prepare and apply for jobs before these positions are occupied. Attaining the required job skills during education years saves students time and gives them advantages in securing the best job positions.

Undergraduate students commonly seek part-time and full-time jobs while studying to financially support themselves. According to (National Center for Education Statistics, 2022), 40% of full-time undergraduate students enrolled in US colleges in 2020 were employed. The types of jobs usually offered to undergraduate students are low-income entry jobs which are unrelated to students' major of study. This has disadvantages such as having to work for many hours to earn sufficient income. Moreover, students waste a lot of time working, when they could have been studying or resting. Furthermore, long working hours and night shifts leads to lack of sleep and fatigue, which negatively influences students' focus during lectures and also reduces their assignment and exam grades.

Students are often faced with limited opportunities to receive the necessary training and experience to keep up with the rapidly changing technology landscape. They attend job fairs or reach out to companies that provide training and employment opportunities, but these opportunities often come with very low salaries and limited opportunities for advancement. In this paper, we address this problem by providing students with the opportunity to receive training, work on real projects,

and earn money, all while still studying. This is achieved by developing Career Craft, a software platform that trains IT students towards enhancing the practical side of their major and introduce them to the job market early on.

1.1. Research Objectives

The ultimate goal of the platform is to ensure that students have the necessary skills and experience to succeed in their future careers. This goal is realized by the following objectives:

1. Provide students with practical experience in the fields of web development, UI/UX design, and web security.

2. Enhance the practical skills of students to meet the demands of the market and increase their chances of getting hired.

3. Improve the reputation of the university by showcasing the capabilities of its students through the successful completion of client projects.

4. Generate financial benefits for both students and the university through client projects.

1.2. Research Importance

The significance of this work is that implementing and utilizing the platform ensure that students engage in software development and are exposed to real-world experience during their years of university enrolment. In addition, student gain experience in programming problem solving and software development. Moreover, implementing Career Craft platform creates a university environment that simulates the market to prepare university students for their future jobs.

2. Related Work

The study in (Edupuganti and Ramyakanth, 2017) investigated the development and implementation of an online grading system to improve the accuracy and efficiency of grading for educators. The system used an online interface for students to submit assignments and for instructors to grade them. Results showed that the system reduced the time and effort required for grading and increased the accuracy and consistency of grades. However, the study also identified some limitations and challenges such as technical issues, training needs, and concerns about academic integrity.

The authors of (Brantmeier and Richardson, 2015) explored the effectiveness of task-based language teaching (TBLT) in promoting student practical skills in language learning.

They found that TBLT increased students' motivation, engagement, and practical skills in a variety of language learning tasks. They also highlighted the importance of providing clear instructions, appropriate feedback, and meaningful tasks that are relevant to students' interests and goals. TBLT however requires extensive planning and preparation by teachers, and might not be suitable for all types of language learning goals or contexts.

A mathematical model for ranking students of online IT courses was developed in (Dronyuk et al, 2019) based on students' academic performance. The proposed model utilized fuzzy logic and weighted averaging to calculate the overall score of each student. The results of the study indicated that the model was effective in ranking students and identifying those who require additional support or interventions. However, the study identified the need for further refinement of the model and the inclusion of other factors that may impact student performance. Moreover, no guidance was specified on how the model could be implemented in practice or how it could be adapted for use in different contexts.

The study in (Al-Ansi and Elrehail, 2017) aimed to investigate the impact of student satisfaction and university reputation on the financial performance of universities. The study was conducted on 16 private universities in Yemen, and the results showed that both student satisfaction and university reputation have a significant positive effect on university financial performance. The study suggested that universities should focus on improving student satisfaction and enhancing university reputation to increase their income. This study did not consider other factors that may affect the financial performance of universities, such as funding sources and government policies. In addition, the study used a small sample size and relied on self-reported data, which may be subject to response bias and social desirability bias.

The effectiveness of project-based learning in enhancing the parallel programing and soft skills of computer science students was investigated in (Younis et al, 2021). The authors conducted a design study with a pre-survey and a post-survey. The control group involved 247 students divided into 51 groups. Each group was assigned 5 projects and allowed two weeks to complete each project. The evaluation showed that group study and collaboration influenced students' ability and extent to learn parallel programing and soft skills, proving the effectiveness of project-based learning.

In this paper we present Career Craft, a software platform that motivates students to focus on the practical side of their specialization and exposes them to a real-world market environment. On one hand, the platform increases programing and problem-solving skills by providing small tasks that

students can solve to earn points. Students are promoted to a higher level as they collect points, which encourages competition. Additionally, the platform enables clients from outside academic institutions to make requests for developing software systems within the institution. This allows students to gain hands-on experience in software development. Using this system, students can increase their employability by working as freelancers for clients. The proposed system focuses on three key IT areas: web development, UI/UX design, and web security. The platform has four functions:

- Admin: in charge of running the platform and maintaining its functionality.

- Manager: responsible for creating and adding tasks to the platform as well as managing software projects.

- Student: solves tasks and participates in teams to develop software projects.

- Client: interested in purchasing a software system.

The rest of the paper is organized as follows: Section 2 explains the necessary approaches to enhance student skills. Section 3 describes the design of the proposed platform. Section 4 demonstrates the implementation of the platform. Section 5 concludes the paper.

3. Student skills enhancement

There are a number of factors that contribute to enhancing students' skills and facilitate securing a job following graduation. These include technical skills, training, experimental learning, and keeping up with advancements in the field of computer science.

3.1 Technical skills

Technical skills include the practical knowledge that is used to solve tasks related to IT such as programming, data analysis, graphics design etc. To enhance students' technical skills, it is essential that they receive technical training while they are still in school. This training can take the form of internships, workshops, and hands-on projects, allowing students to gain practical experience. By doing so, students are better prepared to enter the workforce and have a competitive edge in the job market.

3.2 Training

One study conducted by the Freelancers Union and Elance-oDesk (now Upwork) (Freelancers Union, 2014) found that freelancers are more likely to find skill-related training valuable to the

work they currently do, rather than a college education. 70% of full-time freelancers participated in skill training, compared to 49% of full-time non-freelancers. Freelancers seek training to enhance their skills in areas that affect freelancers the most: technology, networking, and business management.

3.3 Up-to-date knowledge

Students in the field of computer science need to keep up with the rapid pace of technological change. The technology industry is constantly evolving, and students must be equipped with the latest skills and knowledge to remain competitive. Technical training provides students with the opportunity to update their skills and remain marketable as the job market evolves.

3.4 Experiential Learning

A recent study by the National Bureau of Economic Research (NBER) (Barr and Turner, 2020) found that students who participated in experiential learning opportunities were more likely to be employed after graduation and to earn higher salaries than their peers who did not participate in such programs. The study also found that these benefits were most pronounced for students in fields such as computer science and engineering, where hands-on training is particularly important.

The benefits of experiential learning extend beyond the students themselves. Companies that offer internships and co-op programs often report improved productivity and increased innovation, as students bring fresh perspective and new ideas to the workplace. Additionally, by providing training and mentorship to students, these companies are able to cultivate a pipeline of skilled workers and build relationships with the universities and training programs with which they partner.

In light of the above-mentioned requirements, it is clear that there is a need to prepare students with necessary skills prior to graduation. Providing student with a system that facilitates practical training and real-world experience in their field of study is a step towards achieving this goal.

4. Methodology

Career Craft is a comprehensive web-based platform that offers a range of opportunities for students who are interested in pursuing a career in web security, UI/UX design, or web development. In addition, the platform is designed to help clients find highly skilled and experienced professionals who can provide quality services in their respective fields. The platform offers a variety of tasks that students can complete to practice their skills and gain real-world

experience. These tasks are categorized by service type, allowing students to focus on the area in which they are most interested. The platform also employs a ranking system to classify students based on the number of tasks they have completed. The higher a student's rank, the more likely they are to be selected for client projects. This provides students with a practical opportunity to work on client projects and further develop their skills, while also making them more attractive to potential employers.

4.1 System elements

The platform consists of tasks that students solve to compete, and roadmaps to guide them and explain how to solve these tasks. It also consists of client projects in which students enroll after creating a group supervised by a teacher to develop the requested project.

4.1.1 Tasks

There are three types of tasks in the platform, namely web development tasks, UI/UX design tasks, and web security tasks. The difficulty of each task is determined by the manager, and is assigned a corresponding number of points based on its level of difficulty. The platform has three levels of difficulty: easy, medium, and hard, and each task can only be solved by a single student.

There are two types of web development tasks: back-end and front-end. Easy tasks are directly submitted to the platform. On the other hand, after solving medium and hard web development tasks, students are required to submit a link to the repository of their solution on their GitHub account.

For UI/UX design tasks, students are required to upload a .rar file containing all the screens required for the task. In the case of web security tasks, the platform offers CTF (Capture the Flag) challenges for the students to solve, and they are required to submit the flag found on the given URL. For easy web security tasks, students only need to submit the flag, while for medium and hard web security tasks, they need to write a report explaining how they found the flag.

4.1.2 Teams

In the Career Craft platform, the students are given the opportunity to form teams or join existing ones, depending on their preferences. Once a student creates a team, they can apply as a team for client projects. To join an existing team, the student must enter the unique invitation link, which is created automatically upon the team's creation. This feature provides students with the chance to collaborate and engage in team-based projects, thereby enhancing their skills in teamwork and

project management, which are highly valued in the workforce. Additionally, it fosters a sense of community and encourages the students to interact with their peers, facilitating knowledge-sharing and peer-learning opportunities. Overall, this feature adds an essential layer of interactivity and collaboration to the Career Craft platform, which helps students develop their practical skills and knowledge in the fields of web development, UI/UX design, and web security.

4.1.3 Client projects

A client who is interested in purchasing a software system applies through the platform. The client must specify the desired service in details and upload all necessary information including timeframe. Upon receipt of the request, the manager establishes the number of necessary team members required to undertake the project, and subsequently, will release the project for student applications. Upon conclusion of the application period, the manager will then screen the candidates to determine the most suitable team members for the designated roles, and subsequently form a team for the specific project. Once the team is established, the manager will initiate the project development phase and update the progress of the project on the platform which is reflected to the client.

4.1.4 Roadmaps

Roadmaps are an integral feature of the Career Craft platform, offering a simple overview of the background knowledge required to work in each of the three fields, namely web development, UI/UX design, and web security. In addition, these resources provide students with a clear understanding of the skills they need to develop and the types of tasks they will be expected to complete in a professional environment. Managers are entrusted with the responsibility of creating, editing, and updating these roadmaps. The roadmaps are designed to be comprehensive and offer a detailed description of each service, including the theoretical and practical aspects. This feature is essential to ensure that students can develop a strong foundation and practical skills, which they can use to solve real-world problems in their respective domains. Additionally, managers have complete autonomy to update the roadmaps regularly to keep pace with the dynamic nature of these domains, and incorporate the latest advancements, which are necessary to stay competitive in the industry.

4.2 System functions

Career Craft platform has four users with specific functions that are necessary for the platform to operate effectively. Following, the system functions are described.

4.2.1 Admin

The admin is responsible for the following tasks:

- Ensure the smooth flow of data and services.

- Manage users and responding to their requests.

- Backups, recovery and report generation.

4.2.2 Manager

The manager is in charge of the following:

- Receive client projects and publish them for students.

- Specify the number and specialty of positions required for clients' projects.

- Create, edit, or delete tasks, and rate the solution of tasks submitted by students (for non-automated graded tasks).

- Setup and manage meetings with students (rank upgrade and project meetings).

- Create, edit, or delete roadmaps for students.

4.2.3 Student

The student is the primary user of the platform with the most interaction. The platform provides students with the following capabilities:

- Solve tasks to upgrade their rank.

- Apply for client projects published by managers.

- Create or join teams.

- Read roadmaps published by managers.

- Manage profile (select an avatar, nickname, and main specialty: web developer, UI/UX designer, or web security).

4.2.4 Client

The client has the following features:

- Request software projects.

- View the progress of ongoing projects.

- Rate students who participated in project development.

4.3 Points and ranking system

The Fibonacci sequence (Fibonacci sequence, 2023) is a series of numbers in which each number is the sum of the two preceding numbers. It starts with 0 and 1, and then each subsequent number is the sum of the previous two. The sequence is: 0, 1, 1, 2, 3, 5, 8, 13, 21, 34, 55, 89, 144, 233, and so on.

The Fibonacci sequence is often used in various fields, including mathematics, computer science, and finance. One common use of the Fibonacci sequence is as a ranking system. The idea is to assign points to different levels or ranks based on the Fibonacci sequence. The higher the rank, the higher the points.

Following are some examples of games that have used the Fibonacci sequence as a ranking system:

  − Bloons Tower Defense 4 (Bloons Tower Defense 4, 2023): in this tower defense game, the amount of money earned per pop is based on the Fibonacci sequence.

  − Angry Birds Space (Angry Birds Space, 2023): in this game, the power-up system is based on the Fibonacci sequence.

  − The Legend of Zelda: Skyward Sword (Nintendo, 2023): the number of collectible Gratitude Crystals required to earn various rewards is based on the Fibonacci sequence.

  − Runescape (Runescape, 2023): this Massive Multiplayer Online Role-Playing Game (MMORPG) uses the Fibonacci sequence to calculate the experience points earned for certain skills.

  − Final Fantasy (Final Fantasy, 2023): this popular role-playing game series uses the Fibonacci sequence to determine the strength of some of the game's monsters and bosses.

The ranking system utilized in this project is based on the Fibonacci sequence as well, and it starts from level 2 with the rank *F*. The mathematical equation shown in Equation (1) is used to calculate the points for each rank as follows:

$$y = \text{fibonacci}(x) \times 100 \qquad (1)$$

where x is the level of the rank.

The system has eight ranks from *F* to *S*, where *F* is the lowest rank and *S* is the highest. To reach a higher rank, a student must accumulate a certain number of points based on the Fibonacci sequence. The point ranges of ranks are as shown in Table. 1.

Rank	Start Point	End Point
F	0	100
E	101	200
D	201	300
C	301	500
B	501	800
A	801	1300
S	1301	2100

Table. 1. Point range of ranks

Students can upgrade their rank by clicking on the *Upgrade Rank* button once they have accumulated sufficient points for the next rank. However, to upgrade from rank *D* to *C*, students must first request an interview with a manager. The manager will then review the student's profile, assess his capabilities and make a decision accordingly.

In addition to rank-based points, tasks also have their own difficulty levels. There are three levels for task difficulty: Easy, Medium, and Hard. The minimum and maximum number of points for each difficulty level are shown in Table. 2.

Level	Minimum Points	Maximum Points
Easy	5	10
Medium	40	50
Hard	80	100

Table. 2. Task Difficulty Points

It is the responsibility of the manager to assign the difficulty of each task and specify number of points awarded to the students when correctly solving the task.

In conclusion, the ranking system is based on the Fibonacci sequence, which assigns point values to different ranks. The higher the rank, the higher the points. The system also includes task difficulty as well as stars.

5. Implementation and Results

Career Craft platform was developed using a number of powerful tools. JavaScript (JavaScript, 2022) was utilized to develop the front-end of the platform, and XAMPP (XAMPP, 2022) was used to create and test the web server. The database management system used was MySQL (MySQL, 2022). For improved user experience, Vue.js (Vue.js, 2022) was selected to design and build the user interfaces. Two frameworks were utilized: Visual Studio Code (Visual Studio Code, 2022) for frond-end development and Laravel (Laravel, 2022) for back-end development. For debugging, Xdebug (Xdebug, 2022) was used.

The implementation of the system involved several stages, including the development of the front-end and back-end architecture, the design and implementation of the Application Programing Interface (API), and the testing and deployment of the system. Throughout the implementation process, the focus was on building a scalable, secure, and user-friendly system that can meet the needs of intended users.

5.1 System architecture

The system architecture consists of a front-end built using the Vue.js JavaScript framework, a back-end built using the Laravel PHP framework, and an API that connects the two.

5.1.1 Front-end architecture

The front-end architecture is built using Vue.js framework, which provides a modular and scalable approach to building user interfaces. The Vue.js framework allows creating reusable components that can be easily integrated into the application, improving the overall maintainability of the system.

5.1.2 Back-end architecture

The back-end architecture is built using Laravel framework, which provides a robust and secure foundation for building web applications. Laravel provides a powerful set of features, including database migrations, authentication, and authorization, that make it easy to develop complex web applications.

The front-end components communicate with the back-end through the API. It provides a set of endpoints that return which returns data in JSON format. This data is then displayed in the user interface using Vue.js data binding and component rendering.

5.1.3 API architecture

The API architecture is designed to provide a secure and scalable interface for connecting the front-end and back-end. The API is built using Laravel's built-in RESTful API functionality. The API also includes authentication and authorization mechanisms to ensure that only authorized users can access sensitive data.

The system architecture for this web-based system is designed to provide a scalable and secure platform for building complex web applications. The Vue.js front-end, Laravel back-end, and JSON-based API provide a powerful combination of technologies that allow for the rapid development of complex web applications.

5.2 Development Process

The development process for the system utilized several tools, including XAMPP, VS Code, Firefox browser, and Postman.

The web server was set up using XAMPP, creating a local development environment to test the code and ensure its smooth running. XAMPP was used to create a MySQL database and Apache server to host the web application.

VS Code was used as the code editor to write and edit the code for the system. It was found to be a highly efficient and user-friendly tool for coding in HTML, CSS, and JavaScript. It was also used to integrate with Git to manage the source code and track changes.

Firefox was used as the web browser to test the functionality of the system, allowing the testing of the responsiveness of the web pages, as well as the overall look and feel of the user interface. Postman was used to test the functionality of the system by sending and receiving JSON format API requests. It was found to be a highly useful tool for testing the system's functionality and ensuring that it worked as expected.

Throughout the development process, best practices for coding were followed, including the use of version control and commenting on the code. Regular code reviews and testing were performed to ensure the quality of the system.

5.3 User interface

Following we display and explain client, admin, manager and student screens.

5.3.1 Client Screen

The client screens, shown in Figure .1, allows new clients to register and existing clients to access their account. It also enables clients to submit their project requirements, and to view the progress of their projects.
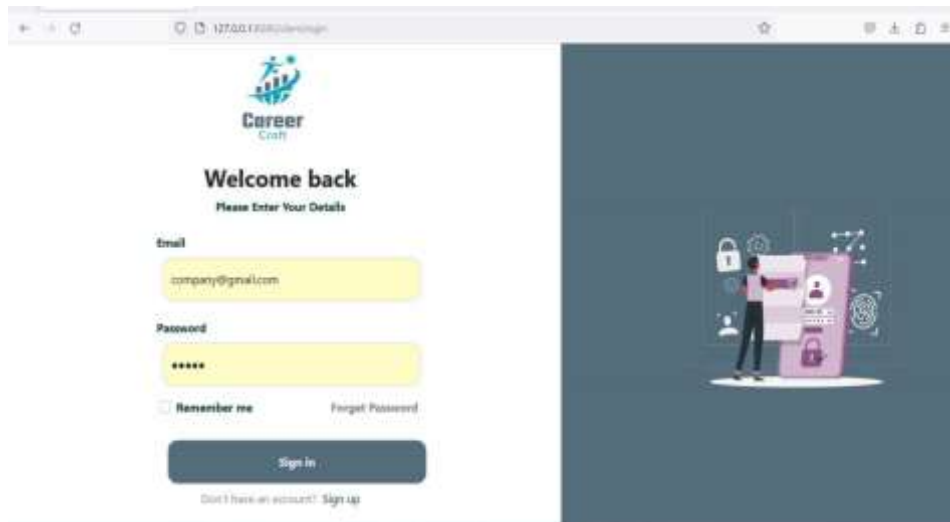

Figure. 1 Client Login Screen

5.3.2 Admin Screens

The Admin Dashboard comprises various screens, including the Admin Add Manager screen and the Manager List for Admin screen. The Admin Add Manager screen allows the admin to add new managers to the system, and the Manager List for Admin screen displays a list of all managers and their details, such as their names, email addresses. The Admin Dashboard screen is shown in Figure .2. helps the admin manage the system and managers efficiently.
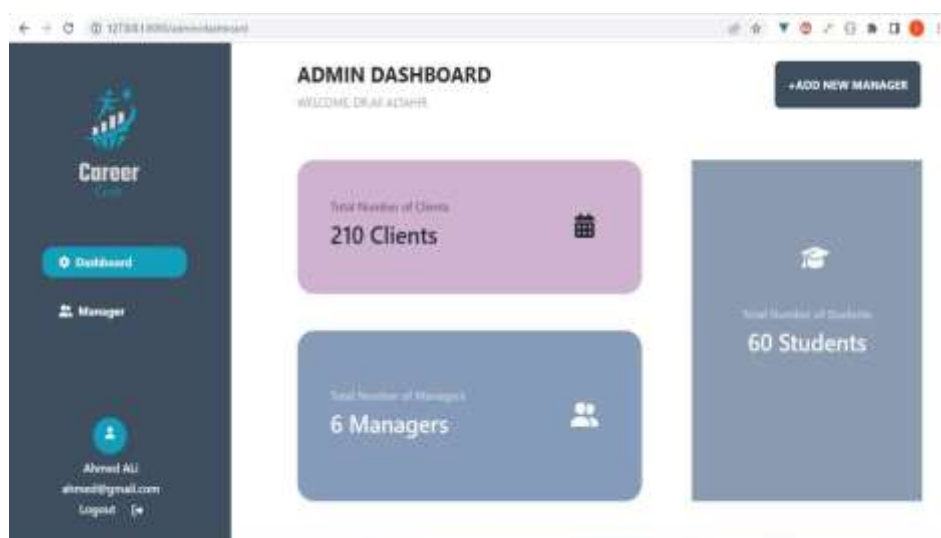
Figure .2 Admin Dashboard Screen

5.3.3 Manager Screens

The Manager Dashboard includes several screens that help managers effectively manage projects and teams, illustrated in Figure .3 throughout Figure .6. The Manager Project Request screen shown in Figure. 3 allows managers to view project requests and approve or reject them. The Manager Approved Projects screen illustrated in Figure. 4 displays a list of approved projects along with their status. The Manager Teams Selection screen enables managers to select team members for projects. The Task Management screen shown in Figure. 5 allows managers to manage tasks. The Manager Rank Interview screen helps managers evaluate candidates and rank them. The Manager Roadmaps Management screen assists managers in creating and managing roadmaps. Finally, the Manager Submitted Tasks screen shown in Figure. 6 displays all completed tasks and allows managers to review them.
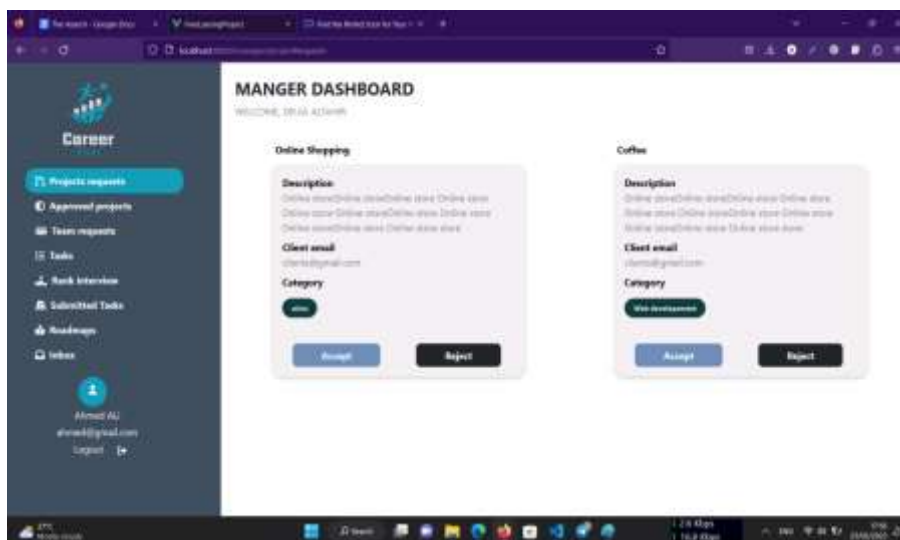
Figure .3 Project Request Screen
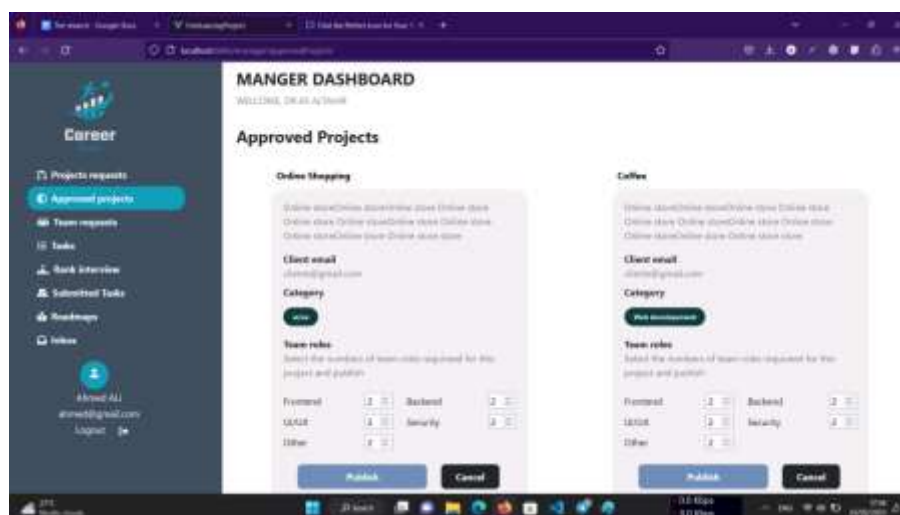
Figure .4 Approved Projects Screen
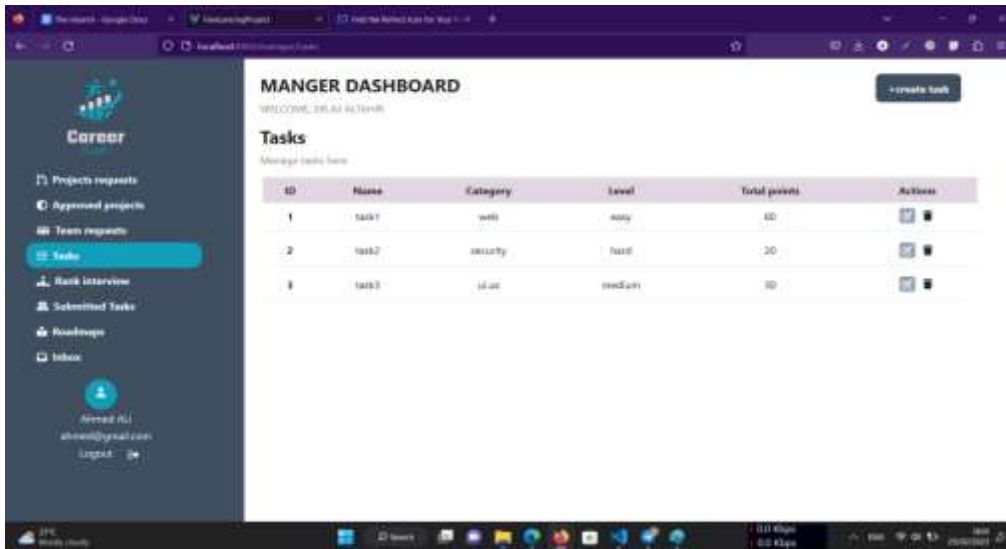
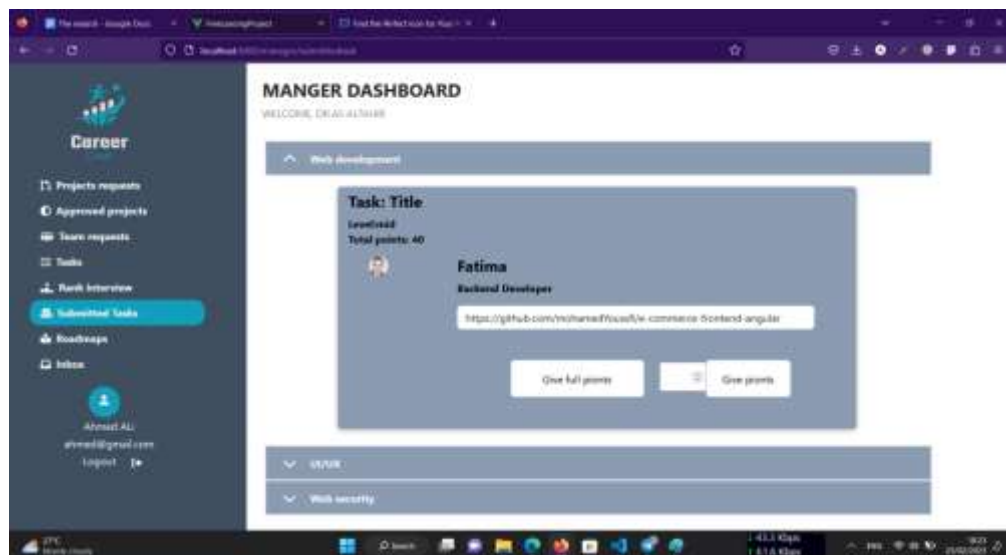**Figure .5** Task Management Screen

Figure .6 Submitted Tasks Screen

5.3.4 Student Screens

The Student screens shown in Figure .7 throughout Figure .10 include a Select Role and Nickname screen where students can choose their role and create a nickname. They can then select an avatar to represent themselves on the platform as can be seen in Figure. 7. The Student Profile Overview screen shown in Figure. 8 displays their progress, such as the number of Magic Cubes earned and the number of completed Platform Quests and Real Quests. The Student Platform Task screen illustrated in Figure. 9 shows the tasks published by the manager, while the Student Clients Project screen displays the approved projects of the client published by the manager.

The Student Roadmaps screen allows students to view roadmaps published by the manager or the client. Students can also receive notifications on the notification screen as Figure. 10 shows.
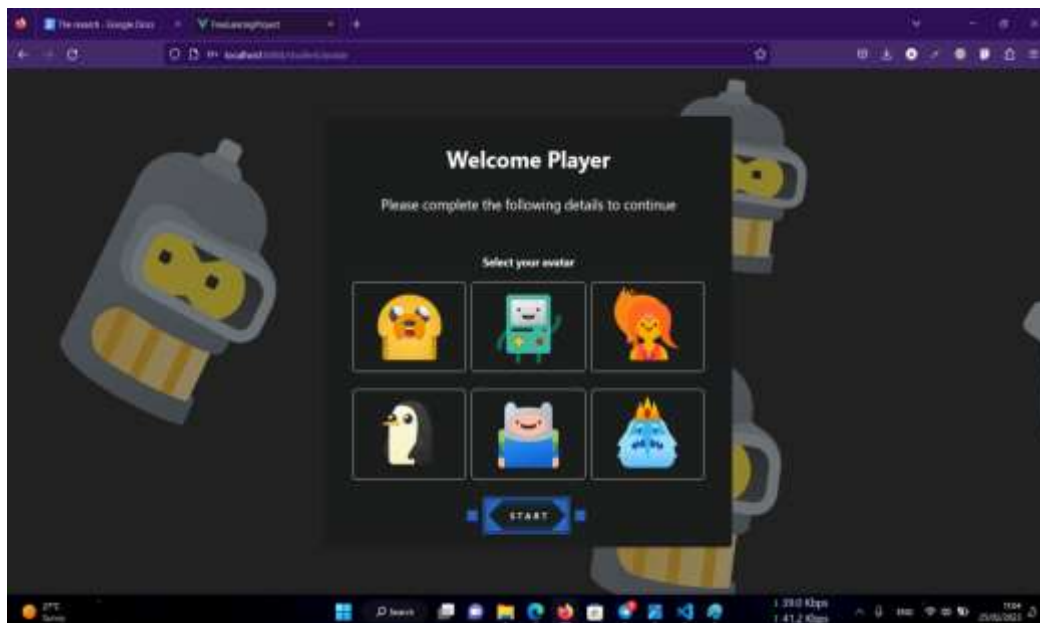

Figure .7 Avatar Selection Screen

Note that the term Quest here means Task while Magic Cubes mean the points. Platform Quests refer to the tasks created and published by managers whereas Real Quests imply approved projects of clients published by the project manager.
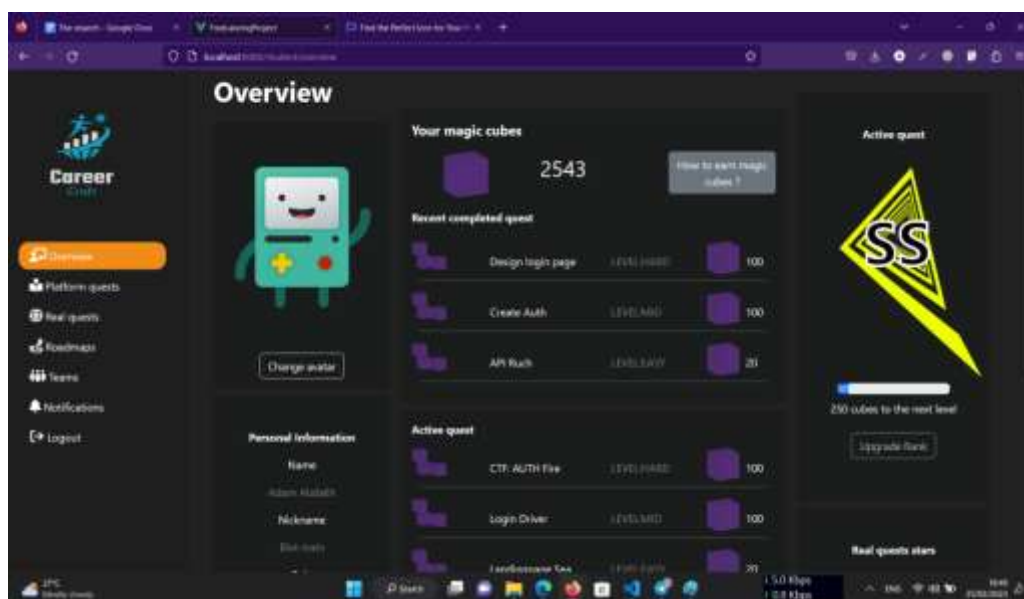

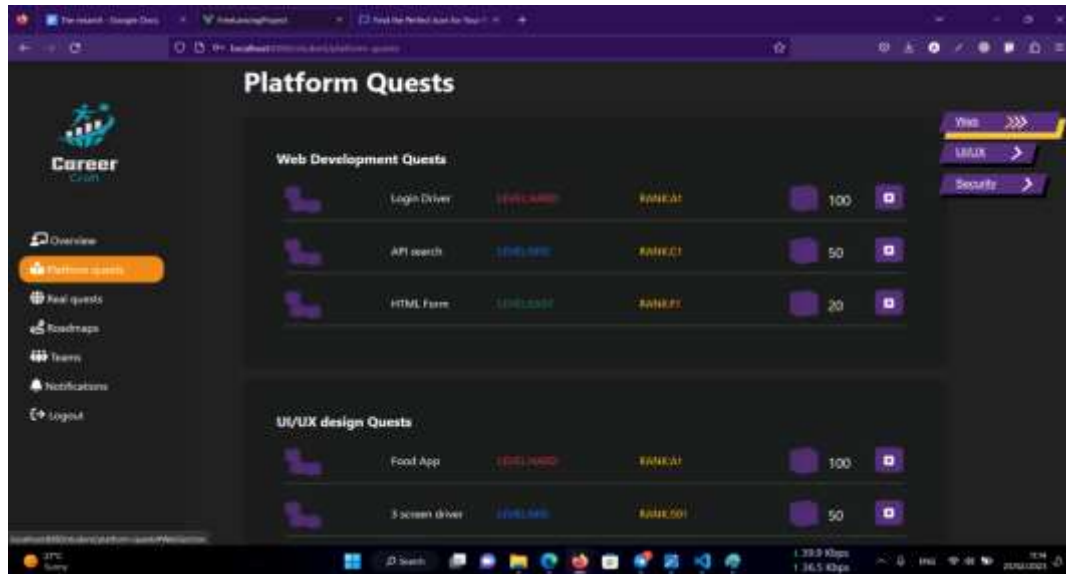**Figure .8** Student Overview Screen
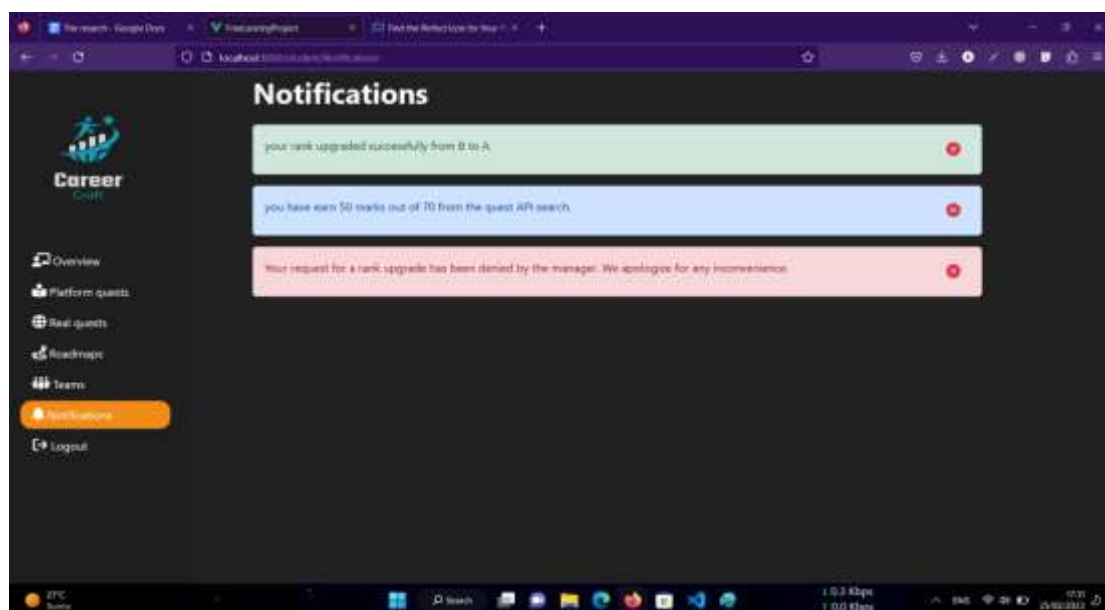
Figure .9 Student Platform Task Screen

Figure .10 Student Notifications Screen

5.4 Testing

To ensure the quality and reliability of the system, a comprehensive testing process was employed, including unit testing, integration testing, and user testing. Unit testing involved testing each individual unit or component of the system in isolation. This helped to identify and fix any defects or issues with each component before they were integrated into the larger system. A variety of testing frameworks and tools, such as Jest and Enzyme, were used to automate the process of unit testing.

Integration testing was performed to verify that the individual components of the system worked together as expected. This involved testing the interaction between different components and ensuring that they integrated seamlessly with each other. Tools such as Selenium and Cucumber were used to automate integration testing.

User testing was conducted to ensure that the system met the needs and expectations of targeted users. A series of user testing scenarios were designed and executed, based on real-world scenarios, to ensure that the system was both functional and user-friendly. Feedback from users was gathered and used to refine and improve the system.

6. Conclusions

Providing students with practical training and hands-on experience in the field of web development, design and web security is essential for their success in the workforce and for meeting the demands of the job market. A platform that provides students with opportunities for experiential learning is an important step towards bridging the gap between the skills that students learn in the classroom and the practical skills that are required in the workplace. This paper has presented the design and implementation of Career Craft, a software platform that aims at training Information Technology students in programming to improve their problem-solving skills and exposing them to the real-world market environment. Implementing and using the platform encourages students to spend extra time on programming by motivating competition among them and enrich their experience preparing them for programming jobs in the future. Furthermore, it enhances the reputation of the academic institution and generates financial benefits through the successful completion of client projects.

7. Recommendations

To further improve the platform, we plan to design messaging features to allow communication between students, managers, and other stakeholders. This will help create a sense of community among the students, as well as provide them with a platform to communicate and collaborate with their peers and managers. In addition, we also plan to create tournaments that set challenges for a limited time to increase competition among students.

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