



Mini Project - SE5104

Final Report

SkillSync: Unlocking Potential, One Skill at a Time

Report submitted in partial fulfillment of the requirement for
BSc (Honors) in Software Engineering

Department of Software Engineering
Faculty of Computing
Sabaragamuwa University of Sri Lanka

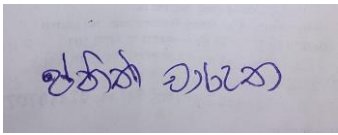
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Declaration

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Table 1 - Team Members Declaration

Registration Number	Name of Students	Signature of Student
19APSE4289	A.I.M. Sabeeb	<i>Shabeeb</i>
19APSE4276	V. Janarthan	<i>V. Janarthan</i>
19APSE4289	J.C. Buwanekabahu	
19APSE4289	A.M.C.I. Aththanayaka	<i>Chamil</i>

Date: 22nd of September, 2024

Certificate of Approval

We hereby declare that this thesis is from students' own work and effort, and all other sources of information used have been acknowledged. This thesis has been submitted with our approval.

P. Vigneshwaran

.....
Head of the Department

/09/2024

.....
Date

.....
Signature of Head of the Department

Dr. L.S. Lekamge

.....
Internal Supervisor

22/09/2024

.....
Date



.....
Signature of Internal Supervisor

Mr. Randika Hapugoda

.....
Mentor

22/09/2024

.....
Date



.....
Signature of Mentor

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Abstract

SkillSync reports on a comprehensive platform designed to revolutionize education and career development in Sri Lanka. By leveraging modern technologies such as MongoDB, ExpressJS, React, and Node.js, SkillSync offers a wealth of features aimed at promoting learning and professional growth. The platform allows users to upload educational content, search for job announcements, collaborate on various projects, and access individual consulting services. It specifically helps trainees create well-structured resumes and prepare for interviews with confidence.

The development of the platform prioritizes user feedback, which is critical for defining features and ensuring relevance to the audience's changing needs. The report's findings indicate that SkillSync effectively increases user engagement and facilitates a smoother transition from learning to employment. It addresses key challenges in education and the job market by connecting learners to career opportunities and providing tools for personal development.

The report also recommends further improvements to the platform, including the integration of AI-powered chatbots, automated assistance tools, and enhanced social media connections. These enhancements are expected to improve the user experience, increase access to learning resources, and streamline the job search process.

In summary, SkillSync represents a significant advancement in bridging the gap between education and career development. Its user-friendly interface, combined with ongoing technological improvements, makes it a vital resource for individuals and groups seeking to develop their skills, explore career opportunities, and navigate the challenges of today's educational landscape.

Team Contribution

Index Number	Name	Contribution
19APSE4289	A.I.M. Sabeeb	Backend Development, Database Connectivity & Documentation
19APSE4276	V. Janarthan	Design, Development, Documentation
19APSE4273	J.C. Buwanekabahu	Front-End Development
19APSE4271	A.M.C.I. Aththanayaka	Requirement Gathering, Development

Table 02 - Contribution of Team Members

Table of Contents

Declaration.....	2
Certificate of Approval	3
ACKNOWLEDGMENT	4
Abstract.....	5
Team Contribution.....	6
Table of Contents.....	7
List of Figures.....	10
List of Tables	12
1. Introduction	13
1.1 Major Goals and Objectives.....	18
1.2 Motivation.....	23
1.3 The Scope of the Completed Project.....	28
1.4 The Approach and Assumptions While Carrying Out the Project Work....	31
1.5 Concise Summary of Major Outcomes	32
2. Background.....	34
2.1 Existing Similar Products.....	34
3. Specification and Design.....	38
3.1 Specification.....	38
3.1.1 Feasibility Study	38
3.1.2 Requirement Engineering	40
3.1.3 Uniqueness of SkillSync	42
3.1.5 Non-Functional Requirements.....	46
3.2 Design	47
3.2.1 User Interface (UI) Design	47

3.2.2	Database Design	49
3.2.3	Backend Architecture Design	51
3.2.4	API Design.....	51
3.2.5	Integration with External Services.....	51
3.2.6	Security Design.....	53
3.2.7	Scalability and Performance	61
3.2.8	Testing and Quality Assurance	61
	Test Cases	63
3.3	Design with UML Diagrams	66
3.3.1	Use Case Diagram	66
3.3.2	ER Diagram	67
3.3.3	DFD Diagram	68
4.	Implementation.....	68
4.1	Software and Hardware Requirements.....	72
4.1.1	Software Requirements	72
4.1.2	Hardware Requirements	79
4.2	Illustration of a Non-Standard or Innovative Way of Implementing an Algorithm and Data Structure	80
4.3	Difficulties Involving Existing Software	81
4.4	Lack of Appropriate Supporting Software	83
4.5	Over-Ambitious Project Aims	84
5.	Results and Evaluation	84
5.1	Final Outcomes of SkillSync	84
5.2	The Comparison of Experimental Results with Expected Values	85
5.3	Description of the Interrelationship of the Experimental Results	87
5.4	Achieved Accuracy	88

5.5	Implications or Limitations	89
6.	Future Work.....	91
7.	Conclusions	93
8.	References	94
9.	Appendices	96
9.1	GANTT Chart	96
9.2	Demonstration Video	97

List of Figures

Figure 01 - Logo of SkillSync	13
Figure 02 - DP Education	24
Figure 03 - LinkedIn	24
Figure 04 - Udemy	25
Figure 05 - Requirement Engineering (RE) Process	30
Figure 06 - Snapshots of the SkillSync MongoDB Database Collections	37
Figure 07 - EmailJS API	42
Figure 08 - Map API	43
Figure 09 - Gemini API	44
Figure 10 - Unfilled Sign-Up as Student	Error! Bookmark not defined.
Figure 11 - Unfilled Sign-Up as Tutor	46
Figure 12 - Unfilled Password Sign-Up as Student	46
Figure 13 - Unfilled Password Sign-Up as Tutor	47
Figure 14 - Without Uppercase - Password Sign-Up	47
Figure 15 - Without a Number - Password Sign-Up	49
Figure 16 - Without 08 Characters - Password Sign-Up	50
Figure 17 - Without Special Characters - Password Sign-Up	50
Figure 18 - Missing Part Following '@' in Email Address	57
Figure 19 - Unfilled Sign-in as Student or Tutor	57
Figure 20 - Hashing of User Password	53
Figure 21 - Testing Stages	55
Figure 22 - Waterfall model	57
Figure 23 - User Case Diagram	58
Figure 24 - ER Diagram	59
Figure 25 - DFD Diagram	59
Figure 26 - DFD Diagram - L01	60
Figure 27 - VS Code Logo	61
Figure 28 - VS Code UI	62
Figure 29 - Windows Logo	64
Figure 30 - Linux Logo	64

Figure 31 - Mac OS Logo	64
Figure 32 – Apache Logo	64
Figure 33 - NGINX Logo	64
Figure 34 - Microsoft IIS Logo	64
Figure 35 - MongoDB	65
Figure 36 - node.js Logo	65
Figure 37 - Express.js Logo	65
Figure 38 - React Logo	66
Figure 39 - CSS Logo	66
Figure 40 - JavaScript	66
Figure 41 - Bootstrap Logo	66
Figure 42 - GitHub Logo	67
Figure 43 - GitHub Repository UI	68
Figure 44 - Gmail Logo	68
Figure 45 - Contact with Gmail	68
Figure 46 - SMS Logo	69
Figure 47 - Figma	69
Figure 48 - Word Processor	69
Figure 49 – PowerPoint	70
Figure 50 - Zoom	70
Figure 51 - Demonstration Video	86

List of Tables

Table 01 - Contribution of Team members	06
Table 02 - GANTT Chart	93

1. Introduction



Figure 01 - Logo of SkillSync

The SkillSync initiative is a call towards the development of a multi-dimensional platform aimed at transforming the educational and career development system in Sri Lanka. This will be designed to provide an inclusive response to the challenges of students, professionals, and employers to overcome situations of inequity, diversity, and resource relevance from an educational and career development perspective. This platform works as a hub and allows the subscriber to access a wide range of features and services, including content publishing, service listing, job posting, project collaboration, and customized consultation packages. The need for specific solutions to the special needs of the Sri Lankan population makes SkillSync a unique platform that merges advanced technology with practical tools for individual empowerment, facilitating personal and professional growth.

In Sri Lanka, a notable disparity is present in the realms of education and career advancement, especially regarding linguistic variety and the availability of high-quality educational materials. Although numerous international platforms provide courses in English, local platforms frequently exhibit a constrained range of services, which fall short in addressing the varied requirements of the populace. Platforms like DP Education provide a restricted number of courses in English, resulting in a substantial segment of the Sri Lankan population who favour education in their mother tongues—Sinhala or Tamil—being inadequately served. Furthermore, social media platforms such as Facebook and professional networking sites like LinkedIn do not specifically address the distinct educational and professional requirements of

individuals in Sri Lanka. Although Facebook offers a range of functions, it does not focus on services related to education or career development, including job postings or advertisements for tuition classes. In contrast, LinkedIn focuses more on connecting people and offering job opportunities rather than helping individuals with education and career building.

Against this backdrop, SkillSync offers a solution that not only bridges the gap in language accessibility but also opens up new vistas for academic and professional growth. Content is available in Sinhala, Tamil, and English, ensuring a larger section of people will have access to learning materials in their preferred language. With a focus on offering multilingual content, SkillSync manages to meet the unique needs of Sri Lankan learners through its facility and resources for personal and professional development.

The introduction of the next generation will consider some basic features such as user signup and login, tutor registration, admin panel, enrolling to courses, quiz enrolments, certificates upon course or quiz completion, integration of an AI language model, service or job listing, rating and review system with feedback mechanism. These are meant to encourage learning, job search, and collaboration-make SkillSync an all-inclusive and user-oriented platform for growth and development.

User Registration & Login[1]

User registration and login options form the very basis for a platform like SkillSync, where users can sign up and log in to access the content customized for them. The functionality has been designed in an intuitive and seamless way to ensure an effortless user onboarding experience. By doing so, the user can create an account and access his education resources, discussion participation, and such offerings of the platform like job postings, service listings, and tool access to project collaborations.

Tutor registration

Tutor Registration

The Tutor Registration feature allows teachers and other professionals to sign up on the site as verified service providers. Tutors can build profiles with a description of their strengths, qualifications, and work experience. This feature allows tutors to list their educational services, such as one-on-one tutoring, group tutoring, or special classes for teaching in particular subjects. This registration process as a tutor allows individuals to offer their services to more clients, increasing their exposure and advancing their careers in the process.

The Admin Panel

The Admin Panel is a crucial feature for managing the platform, which allows the administrators to oversee all user activities, moderate content, and ensure the smooth working of the platform. The Admin Panel allows administrators to control user accounts, course management, service listings, and posting jobs on the platform. Also, it will facilitate the tracking of platform usage, report generation, and resolution of issues that occur. This feature ensures the high quality and user experience standards for SkillSync.

Course Enrolment

The Course Enrolment feature will enable the user to browse through and enrol in diverse courses available on the site. These courses are presented in Sinhala, Tamil, and English, thereby giving the learner the choice to opt for courses in the preferred language. This feature enables the users to locate and participate in courses of their interest and objectives of professional development with ease, thus enabling SkillSync to be a coherent educational tool for individuals at various levels of their careers.

Quiz Enrolment

To enhance the learning experience, SkillSync offers a Quiz Enrolment feature that allows users to take quizzes based on their course enrolments. These quizzes are designed to test the knowledge of the users and determine how well they understand the course material. By taking quizzes, users can track their progress and identify areas where they need to improve. This ensures continuous learning and that the users are indeed learning properly from the material being provided on the site.

Course & Quiz Completion Certificates

Completion Certificates are provided to the participants upon completion of courses and quizzes in recognition of successful completion of the programs. These Completion Certificates will be formal recognition of competencies and knowledge gained, which can also be used in professional profiles or portfolios. This feature enhances learning by giving the users something worth their time and effort, which creates further credibility and visibility for them in their employment sectors.

AI Language Model

In a bid to provide for personalized learning, the site introduces an AI Language Model that offers personalized recommendations, language translation, and helps with the academic assignments. The AI model contributes to better usage of the platform by users through recommendation of relevant courses, services, or job postings that align with users' interests and earlier activities. Besides, this language model facilitates translation of contents among Sinhala, Tamil, and English, hence improving access to the platform and hence the overall user experience.

Service Listing / Job Posting

The feature of Service Listing/Job Posting serves to connect individuals with several opportunities in employment and services. Service providers may advertise educational offerings, including tutoring or consultation services, while employers are able to seek job vacancies or even internships. This mechanism enables interaction between job seekers and employers, thus helping users find opportunities that match their competencies and professional goals. By integrating job postings with educational resources, SkillSync offers a unique and comprehensive approach to career development.

Rating and Review System

To ensure a better quality and reliability experience on the platform, SkillSync has integrated a Rating and Review System, which empowers users with the ability to provide appraisals relating to courses, services, and job postings. This feature introduces transparency and accountability, whereby users are allowed to share experiences and post reviews for others to consider. The platform encourages users to develop the ability to review content and service quality, building a community of continuous improvement and trust.

Feedback Mechanisms

Finally, the Feedback Mechanisms give the end-users the opportunity to share their views about the overall performance of the site and suggest possible points for improvement. This feature encourages user involvement in improving the site, as an administrator will be able to gather useful information and make objective data-driven decisions to advance the user experience. By placing the priority on users' feedback, SkillSync ensures that the platform grows based on the needs of its community, becoming more relevant and user-oriented with time.

In conclusion, with these extensive functionalities, SkillSync belongs to a class of its own, bringing together education, career development, and professional networking into one platform. It develops each functionality with the particular requirements of Sri Lankans in mind to make sure the platform will always remain accessible, user-friendly, and tailored to individual and professional development. It is thus meant to further equip the user, through the interaction with the resources and offerings on the platform, in managing their educational pathways, making connections with mentors and potential employers, and searching for opportunities that best fit their capabilities and aspirations. SkillSync thus stands ready to revolutionize the way people in Sri Lanka approach education and professional development, leveraging an explicit design and commitment to continuous refinement.

1.1 Major Goals and Objectives

SkillSync acts as a wide platform to address education and career development issues of Sri Lanka with a broad range of services to empower individuals, connect them with opportunities, and enhance their personal and professional lives.

The key objectives of SkillSync are to transform the accessibility to educational resources and career opportunities available to Sri Lankans, so that it is a user-oriented platform, satisfying the multicultural needs of the masses. The detail of goals and objectives is given in the section below:

1. Enable Individuals through Accessible Learning Opportunities

Goal: Basically, the goal is to facilitate access to exclusive resources in education and courses across diverse languages so that everyone can learn new skills and grow their knowledge without boundaries based on language preference.

Objective: SkillSync was developed to tear down the barriers in education caused by linguistic differences. Classes and learning resources are provided in Sinhala, Tamil, and English, therefore making sure that users hailing from different linguistic backgrounds can leverage learning opportunities previously confined or inaccessible to them. It will make it possible for learners to take ownership of their learning, enhance their qualifications, and become more employable in an increasingly competitive job market.

Individuals have the opportunity to engage with an array of courses that encompass both technical competencies and interpersonal skills, addressing diverse educational requirements. This goal is in harmony with SkillSync's commitment to enhancing the inclusivity and accessibility of education for all citizens of Sri Lanka, thereby guaranteeing that linguistic barriers do not impede the learning process.

2. Facilitate Career Development

Goal: To link up the users with meaningful employment opportunities and give personalized support to see them through in the career paths.

Objective: SkillSync's aim is to narrow the gap between education and employment by offering a set of features that will help the user both in job preparation and job search. Core to this platform is **the posting of jobs and services**, providing a venue for organizations to post notices about job vacancies, internships, and freelance opportunities. Users should be able to view these postings, apply to those best matching their skills, and engage in professional development.

Additionally, SkillSync offers consultation services which are programmed to advise on resume development and interview readiness to ensure that the users are well prepared to face the job market with confidence. This consultation service is offered to guide the interns and job applicants to formulate an appropriate professional resume and ace interviews to increase their chances of getting the job they applied for.

This objective aligns with SkillSync's overarching aim of promoting career advancement by equipping users with the necessary tools, resources, and expert guidance essential for their success.

3. Facilitate Collaboration and Networking

Goal: To foster collaboration among learners, educators, and professionals, creating a thriving ecosystem of knowledge sharing and growth.

Objective: SkillSync fosters collaborative participation through its tools, which enable project collaboration and networking with other participants. It is an avenue wherein users collaborate on projects within the online space and can share their experiences while continuing to learn from others there. This will not only enhance teamwork and innovative skills but also grow competencies that are relevant in a modern collaborative working environment.

The feature of **service listing** extends this networking potential by bringing into contact, even users with specialists in various fields. Be it a tutor, a consultant, or any service for skill improvement, SkillSync will provide an avenue for professionals to advertise their services and allow the users to find the expertise they need. In thus fostering collaboration and networking, SkillSync strives to build an interactive learning community marked by free-flowing knowledge and opportunity exchange.

4. Bridge the Language Gaps in Education

Goal: To address the challenges to language accessibility in Sri Lanka's education system, publishing educational resources in Sinhala, Tamil, and English.

Objective: SkillSync seeks to bridge the linguistic gap that characterizes most virtual learning environments. Most international online platforms use only one language-English; this somehow restricts access to the best educational materials to those who do not understand English. On the other hand, regional platforms, like DP Education, have an extremely limited portfolio of courses and also lack variety in content and service.

The main aim of SkillSync is to develop a multilingual platform for course delivery in **Sinhala, Tamil, and English**. This would allow better access to learning and also help meet the peculiar needs of different communities in Sri Lanka. SkillSync makes sure that everyone gets equal opportunities to learn and progress through its services, which provide educational resources in all three languages.

5. Leverage Innovative Technologies to Support Personalized Learning

Goal: Use state-of-the-art technologies, including AI-based, which offer customized learning experiences and generally improve the user experience with the platform.

Objective: SkillSync uses the latest technology in order to provide users with a personalized learning experience. Among the key features of the website is the **AI Language Model** that creates personalized course recommendations based on the user's learning history, preference, and objective. This feature ensures that users get channelled into courses that best suit their needs for better productivity and satisfaction in their learning process.

Additionally, artificial intelligence-powered tools support translation, which means that everything from courses and materials will be made available to the learner in the chosen language. A personalized methodology will definitely enhance the experience, overall satisfaction, and user engagement.

6. Create a User-Friendly Platform for Diverse Needs

Goal: The goal is to develop a platform that meets the diverse needs of learners, educators, and employers by providing a set of accessible features.

Objective: SkillSync is designed with a number of functions targeting the different needs for different user groups. It allows learners to enroll in courses, participate in quizzes, and get completion certificates to track their progress and achievements. Features like User Signup & Login and Tutor Registration make it easy for users to access the platform, whether as students or tutors.

For instructors and tutors, SkillSync offers resources to create and manage courses, assessments, and projects, thus making it easier for them to provide better learning content. Also, the **Admin Panel** allows platform administrators to see user activity, control content, and ensure the smooth running of the site. SkillSync ensures that the platform becomes an all-inclusive tool for educational and professional development by providing a wide range of accessible functionalities to cater to their diversified set of needs.

7. Nurture a Supportive Learning Community

Goal: Community building, where users can share knowledge, give feedback to one another, and continuously learn and improve their professional growth.

Objective: SkillSync encourages community building through its **Rating and Review System** and also **Feedback Mechanisms**. Such tools will help the users to share experiences, review courses and services, and make recommendations for the improvement of the service. This will ensure accountability and hence a constant level of quality in the courses and services being offered through SkillSync. SkillSync supports the establishment of a helpful learning community that allows users to learn from others involved, and with, the community as a whole. This supports SkillSync's core mission of continuous learning and collaborative involvement.

8. Contributions to Education and Career Development in Sri Lanka

Goal: To affect a sea of change in the educational and career advancement structure in Sri Lanka by offering a wholesome solution to clients' needs peculiar to Sri Lanka.

Objective: The broader vision of SkillSync, hence, is to help develop and build a better Sri Lanka in education and at work by providing a platform which meets the specific needs and constraints of the locals. It would try to empower the person through courses in multiple languages, personalized career guidance, and opportunities for collaboration so that one can get suitable and satisfying employment. The **Service Listing/Job Posting** is a feature of the platform that assists in connecting enterprises with competent candidates to develop the local employment market. By creating these opportunities, SkillSync hopes to be in a critical position to affect the future of education and professional development in Sri Lanka.

These are basically the goals and objectives of SkillSync, aligning with its mission so far in transforming education and career development within Sri Lanka. In addition, SkillSync creates opportunities for equal education, enhances professional growth, fosters efforts of collaboration, and leverages advanced technologies that allow people to contribute effectively toward the overall growth in the nation's education and workforce.

1.2 Motivation

Development of SkillSync was highly motivated by a dire need to fill a few gaps that existed persistently in the education and career development ecosystem in Sri Lanka. These include, but are not limited to limited access to educational resources due to limited language proficiency, limited support in career development for students and professionals, and not having one single platform that supports learning and professional growth. The reason behind this project, therefore, is to come up with an integrated approach that equips users with diversified, accessible, and personalized tools of learning and career development.

Following are the motifs which led to the creation of SkillSync,

1. Overcoming Language as a Barrier to Education

One of the main motivations for SkillSync was the **language barrier** that prohibits most Sri Lankans from making use of high-quality educational content out there. On the other hand, international websites like Coursera, Udemy, and edX are providing a pretty big number of courses, but the majority of these are only in the English language. People who do not speak English or feel more comfortable learning in their mother tongue will hardly get enough options from those platforms.

Education platforms, for instance, already exist in Sri Lanka, such as **DP Education**, but they cater to locals, offering a very limited range of courses and mainly in English. This puts the largest part of the population that is more comfortable learning in **Sinhala** or **Tamil** at a disadvantage in terms of available learning resources. The motivation to create SkillSync was to fill this gap by offering courses in **all three languages**, thus making it possible to include all people in Sri Lanka in education.

2. Empower in Career Development

Some of the major motivations were related to addressing the challenges that many people face when trying to **advance in their career**. Given conditions whereby students and young professionals from Sri Lanka have difficulty finding proper job opportunities, have received limited personalized career guidance, and preparation for interviews or professional resume creation is also hard to come by.

There are other platforms, too, like **LinkedIn**, but they are mainly built for networking and recruitment without hosting fully-fledged **career development** - personal counselling concerning resume building and preparation for interviews. SkillSync comes in to fill this gap. It was to develop a network that would not only provide an avenue to its users for jobs but also support them in succeeding through the career guidance tailor-made for them.

3. Creating an All-Encompassing Solution for Education and Career Development

While some services in the current digital space are niche-specific, either academic-oriented or job listing and networking-oriented, very few integrate **learning** and **career development** into one comprehensive yet friendly user interface. A motivation for SkillSync was to build an all-in-one platform catering to both educational and career needs.

For example, **Facebook**, though used by many people in Sri Lanka, is not education- or professionally-oriented in its core purpose, while **LinkedIn** pays more attention to professional networking than education. The motivation to develop SkillSync came out of a need for one platform that would cover all aspects: **learning, job postings, project collaboration**, and **professional networking**.

4. Need for Improved Collaboration and Sharing of Knowledge

One other reason for the creation of SkillSync was the realization that **collaboration** in sharing knowledge is key to learning and career development, but not many provide this effectively between learners, educators, and professionals.

SkillSync was created with the motivation of **making collaboration easier**. allowing users to create projects together, share educational content, and seek help from experts in one field or another. Its **project collaboration** and **service listing** functionalities allow users to connect to others for skill development, consulting, or tutoring. It's motivated by the desire to provide a community-oriented platform where users can learn from courses and others.

5. Encouraging Inclusive Education and Professional Growth

Another critical reason for SkillSync was to encourage **inclusive education** and **professional growth** in order to meet the needs of user groups like students, educators, interns, professionals, and employers. It opens avenues for users to showcase their skills, achievements, and experiences by providing **user profile and portfolio** functionality along with **job postings** and **service listings**.

It is intended to let the users have **personal and professional growth** by including necessary tools that would facilitate them in learning, collaboration, and career success. This is an initiative that wanted them to feel themselves in an environment where people from all different backgrounds and needs could know their potential in terms of availability and possibility for meeting everyone's needs.

6. Improving Learning with Technology

The motivation for SkillSync came through the need to enhance learning experiences using **technology**, especially through **AI**. Regarding the **AI Language Model**, on the platform, it applies to providing the best course recommendations and translation services to make sure users get the content best fitting their learning preferences and needs.

SkillSync uses the power of AI technology to allow learners to go through the course in a more personalized and efficient way. Since people learn things in different ways, that personalization really matters. Today, they needed to create a platform that would not only push content but also respond according to the needs of the user, hence driving engagement and effectiveness in learning.

7. Response to the Growing Demand for Digital Skill Development

In modern employment today, which is fast changing one, there is an ever-increasing need for **digital skills** and the ability to adapt to new technologies. The majority of traditional systems of education in Sri Lanka are not well prepared to meet this demand in classes, especially regarding flexible on-demand learning opportunities. The motivation behind SkillSync was the urge to create a platform catering to this need through offering courses in focused areas such as **digital skills, technology, and professional development**.

SkillSync is driven by a zeal to better equip users for the modern workforce with courses in areas like coding, project management, and digital marketing. Course enrolment and a completion certificate further make the platform's offer so much more appealing to any potential employer, hence enhancing career prospects.

8. Creating a Platform for Lifelong Learning

Another key motivation for SkillSync was that the organization wanted to establish an online platform for lifelong learning. As times change with industries and technologies, one needs to continuously update their skills and knowledge. It was with such motivation that SkillSync came into being-to offer users a place they can practice continuous learning either as a student, professional, or educator.

The diversity of courses included in the platform is further complemented by features such as **quiz enrolment** and **completion certificate**, through which users trace their progress and stay motivated to continue learning. Such motivation goes in line with the modern trend of **self-paced, flexible learning**, which meets the different needs of individuals at different times in their career.

SkillSync was therefore born out of the need to bridge the gaps in education and career development in Sri Lanka. It seeks to equip individuals for personal and professional growth, while at the same time contributing to the greater growth of the job market in Sri Lanka through the provision of a platform hosting **multilingual courses, career guidance, collaboration tools, and advanced technologies**. Inclusive, user-friendly, and community-driven, the platform provides a one-stop solution for learners, educators, and professionals alike in their quest to skill up and move forward in their careers.

1.3 The Scope of the Completed Project

The **SkillSync** project is an ambitious attempt at filling critical gaps in Sri Lanka's education and career development ecosystem through a one-stop platform. Its development responds to several challenges faced in accessing and delivering high-quality educational content, career guidance, and employment opportunities by learners, educators, professionals, and employers alike. This project encompasses a number of functionalities that provide support at various levels of learning and professional development and therefore create a single point of access to knowledge sharing, skills development, and career opportunities.

1. Multilingual Educational Content

The key role of the project is in the development and delivery of **multilingual educational content**. SkillSync is mindful of the linguistic diversity of Sri Lanka and therefore offers courses in **Sinhala, Tamil, and English**, targeting a larger audience than most of the currently available platforms. This is to ensure that learners at a lower proficiency in English also have the opportunity to access high-quality educational resources in their choice of language. It allows features that enable educators and experts to **upload content** in the form of videos, presentations, and articles for users of different linguistic backgrounds to access.

2. User Sign Up and Login System

SkillSync's powerful **User Sign-up and Login System** shall ensure safety in entry and smooth navigation into the platform. It shall give an avenue for multiple types of users, including students, educators, professionals, and employers, to sign up for an account and manage their activities. This system shall enable users to apply for courses, collaborate on projects, post services, and apply for jobs. The scope shall also cover security features like **password protection** and **user authentication**, which ensure users' data and accounts are secure.

3. Tutor Sign Up and Service Listing

SkillSync provides educators with **Tutor Sign Up** and a facility to create comprehensive tutor profiles, stating their qualifications and listing their educational services to include **one-on-one consultations** for tuition, tutoring, and skill development workshops. On the other hand, **Service Listing** facility is made available in order for professionals and businesses to advertise their offerings, whether it be consulting, collaboration on projects, or freelance work. This aspect of the project ensures SkillSync acts as a marketplace for **educational services** apart from being a hub for career development resources.

4. Job Posting and Career Development

With the **Job Posting** feature, it provides opportunities for employers to post job and internship openings, making potential job seekers' lives much easier while finding open opportunities that match their interests and skills. In this platform, for instance, an employer can be in a position to go through the profiles, portfolios, and resumes of probable candidates to facilitate recruitment. Other career development tools include **resume-building services** and **interview preparation consultations** brought to users by SkillSync to enhance their employability.

5. Admin Panel for Managing the Platform

The Admin Panel is the vital part of the SkillSync platform, through which administrators take care of the user accounts, content moderation, and service listing. The administrator will go over course submissions, tutor registrations-approve or reject them-and also verify job postings to ensure that they pass the set standards of the platform. This feature will ensure that the platform works in the right direction and sustains a quality standard for the users.

6. Course and Quiz Enrolment

The **Course Enrolment** feature of SkillSync allows users to enrol in the courses they are interested in, therefore giving them an avenue towards self-directed learning over many subject matters. Moreover, the **Quiz Enrolment** feature, which works in the same learning environment, will allow users to check their knowledge and monitor further progress. Additionally, the **quizzes** and **assessments** included in the course will make learning more interactive and enhance a user's ability to review their comprehension of the subject matter.

7. Completion Certificates and Progress Tracking

Upon completion, SkillSync provides **Completion Certificates**, which are official documentation of one's work output and achievement. This will go nicely in their portfolios, broadcasting on professional networks, and as evidence of skill improvement for job applications. The **progress tracking system** lets the user see their progress through various courses, enabling them to maintain their motivation and accountability.

8. AI Language Model for Personalization

Probably one of the most innovative features of SkillSync is the inclusion of an **AI Language Model**, which tailors the learning experience for its users. The AI system would thereby suggest courses based on what the user has engaged with previously, showing interest in and proficiency levels, so that users are exposed to content which best aligns with their personal and professional goals. This feature further enhances user engagement in the learning experience by making it more relevant and efficient.

9. Rating and Review System

SkillSync incorporates a Rating and Review System whereby users can provide feedback on courses, tutors, and services that they avail themselves of. This puts up the quality standard of general services provided because users can make decisions for themselves based on other people's experiences. In this way, it also acts like a feedback mechanism that will help improve course content and services over time in building community-driven learning and development.

10. Feedback Mechanisms and Continuous Improvement

Finally, there are **Feedback Mechanisms** on the platform that enable a user to suggest improvements, report problems, or request additional functionality. The feedback loops ensure the platform constantly evolves to meet the needs of the users; hence, it's going to be a truly responsive and dynamic environment for learning and professional growth. Based on such feedback, administrators carry out continuous improvements in functionality and the user experience of the platform.

The SkillSync project will encompass everything from multilingual educational content and career services, to project collaboration and AI-powered personalisation, making the platform holistic and inclusive for education and career building. It is designed to deliver resources for personal growth but also to create a sense of community and collaboration among its users, thus being a transformative tool in personal and professional development.

1.4 The Approach and Assumptions While Carrying Out the Project Work

A number of key approaches and assumptions underpin the development of the **SkillSync** platform, each consciously chosen and applied to guarantee the successful revolution of education and career development in Sri Lanka. First, there is the **user-centric approach**; a survey and feedback from potential users-students, educators, and employers-are considered in order to perceive their needs, ensuring an intuitive and accessible platform. The **waterfall methodology** followed in the project provides that each phase, right from the requirements gathering to final product testing, is properly

planned and executed. This route will help the team avoid the risks by following an orderly way. **Collaboration and teamwork** are the intrinsic part of project diversification; a diversified development team comprised of software developers, designers, and project managers has to work hand in glove with each other in order to make active sharing of ideas and problem-solving effective. Regular meetings would be necessary for effective communication, enhancement of creativity, and alignment towards the goals of the project. The choice of a robust **technology stack**, like MongoDB, Express.js, React, and Node.js, can well be justified by the functionality and scalability features of the platform. In this new stack, SkillSync can retain a potentially large user base and keep all future updates smooth. **Security and assurance** of data privacy are also high in the list; proper security measures, including the encryption of data and secure user authentication, shall be in place to ensure that sensitive information of the users is kept confidential-a process crucial to foster trust among users, ensuring at the same time that the law is abided by. Finally, the project is premised on the assumption of strong **market demand and viability**: detailed market research has revealed shortfalls in current educational platforms and underlined the need for accessible and multilingual resources in Sri Lanka. By aligning SkillSync with emerging market needs, the team positions the platform to be relevant for the solution it provides to the users.

An integrated approach to focusing on user needs, structured development, effective collaboration, strong technology foundations, security, and market alignment indeed makes sure that SkillSync is well-equipped to empower individuals for growth within the community and realize its mission of transforming education and career development in Sri Lanka.

1.5 Concise Summary of Major Outcomes

This project, SkillSync, achieves a number of important results in the enhancement of education and career development across Sri Lanka. First, it should effectively provide access to a user-friendly interface for multilingual educational resources in Sinhala, Tamil, and English, thus bridging this gap in language access. There are different features on the platform: user sign-up and login, tutor registration, course and quiz

enrolment, and a robust admin panel to assist users in their user experience. Also, an AI language model is integrated to promote better interaction and support with the users. It is also going to introduce a service listing feature and job posting capability, which would be capable of connecting users with the available opportunities, while at the same time giving an avenue for rating and reviewing to cover quality and accountability.

Feedback mechanisms will be integrated to allow for continuous improvement informed by users. Therefore, SkillSync empowers individuals through personalized consultation services for internships and creates an avenue for its users to collaborate and further develop their skills, thereby reinforcing it as an essential tool for personal and professional growth within the Sri Lankan context.

2. Background [2]

In Sri Lanka, there exists a significant gap in education and career development, particularly in terms of language diversity. There are many well-known global platforms that offer courses in English, whereas local solutions are limited in terms of scope and accessibility. Existing local platforms like DP Education provide only a limited selection of courses available only in English, while not fulfilling the needs of the population who prefer learning in native languages such as Sinhala or Tamil. Moreover, existing social media platforms such as Facebook cater to a wide range of purposes, making it difficult to focus on specific educational or career-related services like job postings or tuition class advertisements. Similarly, professional networks like LinkedIn are tailored by mainly focusing on networking and recruitment, rather than serving as a comprehensive platform for educational or career development related service listings.

Therefore, to address all these challenges, there is a pressing need for an all-in-one solution like SkillSync, which bridges the gap in language accessibility and offers many educational and career development opportunities tailored to the specific Sri Lankans' needs. By providing courses in Sinhala, Tamil, and English, along with personalized consultation services for interns to give them expert guidance, SkillSync aims for individuals to facilitate personal and professional growth.

2.1 Existing Similar Products

Existing websites like DP Education, Udemy, and LinkedIn offer valuable solutions to effectively support learners, educators, and employers in today's fastly improving job market. These platforms leverage technology and innovative design to provide users with a range of features and functionalities aimed at enhancing their skills and transition into meaningful careers.

2.1.1 DP Education [3]

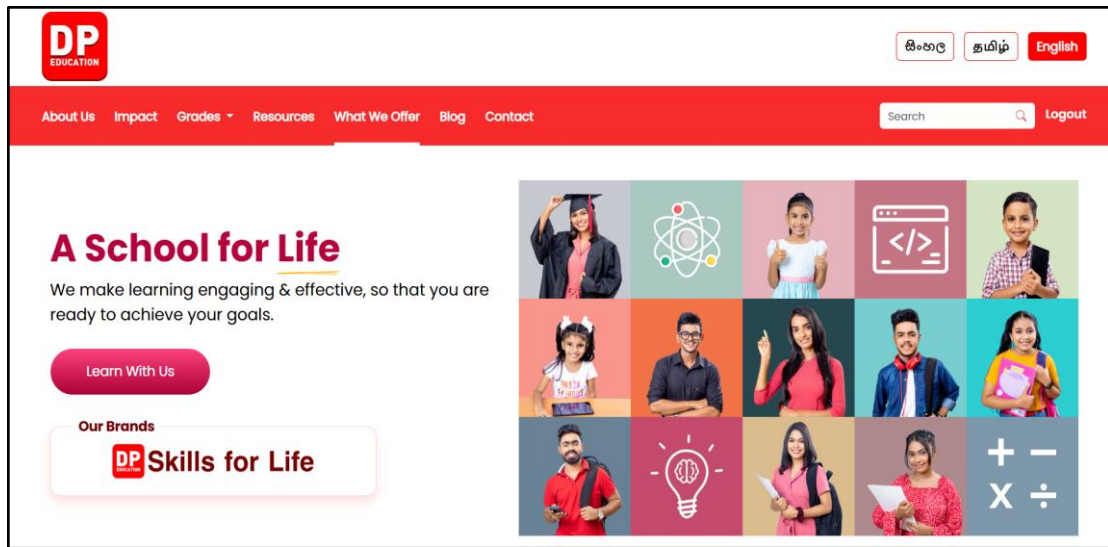


Figure 02 - DP Education

DP Education, for instance, is a popular educational website that provides online courses and tutoring services in Sri Lanka. It mainly focuses on enhancing learning opportunities for students across various subject domains, by offering academic support and skill development. With its intuitive interface and customizable features, DP Education typically offers courses in English language and may cover areas such as exam preparation, language skills, and vocational training. Although DP Education addresses the educational needs of learners in Sri Lanka, it has been noted that its functions and features are limited in scope. Listed below are some drawbacks noticed in DP Education.

1. Limited course selection.
2. Lacks focus on skill-based development.
3. Lacks interactive or community features.
4. Limited course instructors.
5. Limited support for career development and job placement.

2.1.2 LinkedIn [4]

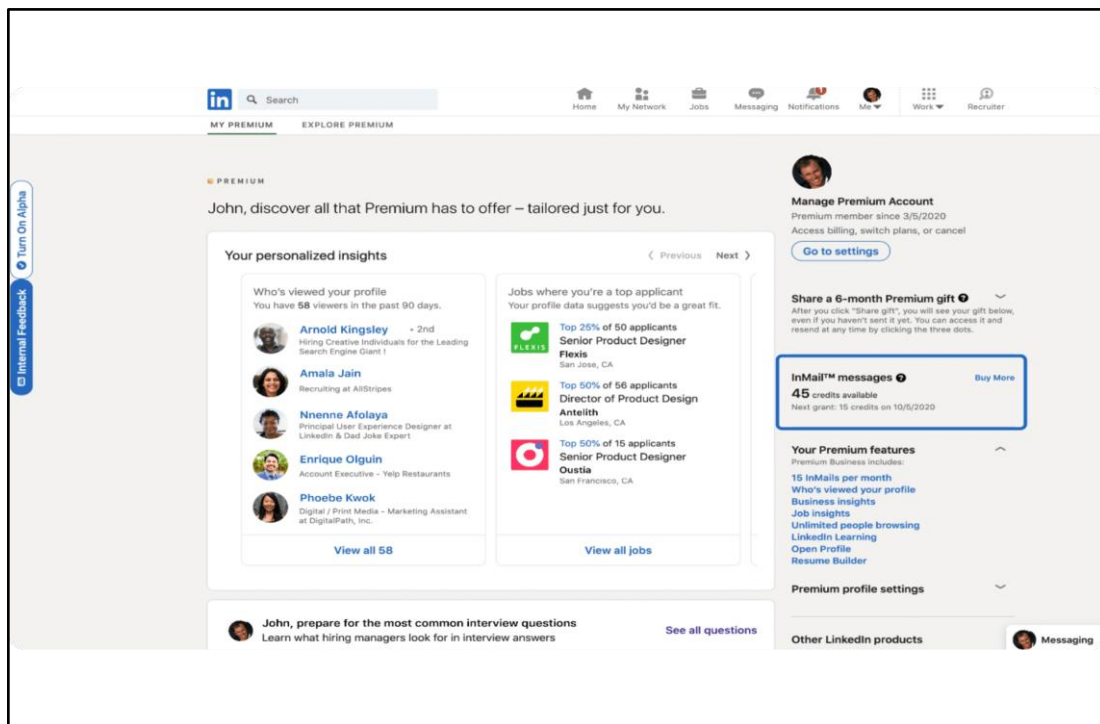


Figure 03 - LinkedIn

LinkedIn is a globally recognized professional networking platform that allows individuals and businesses from nooks and corners of the world to connect, share, and engage with each other. It provides a space for professionals to showcase their skills, expertise, experiences, and accomplishments through user profiles, and to build networks among individuals. Users can post feeds, share informative content, and participate in discussions, making it a valuable resource for job searching, recruiting, and professional development. Additionally, companies can create pages to promote their brand, post job openings, and connect with potential employees. Overall, LinkedIn is an essential tool for career development and business networking. Listed below are some drawbacks noticed in LinkedIn with regard to the Sri Lankan context.

1. Fewer number of localized job postings and limiting job-seeking opportunities when compared to global job markets.
2. Many professionals in Sri Lanka do not actively use LinkedIn as it is not completely tailored to the Sri Lankan audience.

3. Higher number of applicants for job postings, making it difficult for individuals to stand out.

2.1.3 Udemy [5]

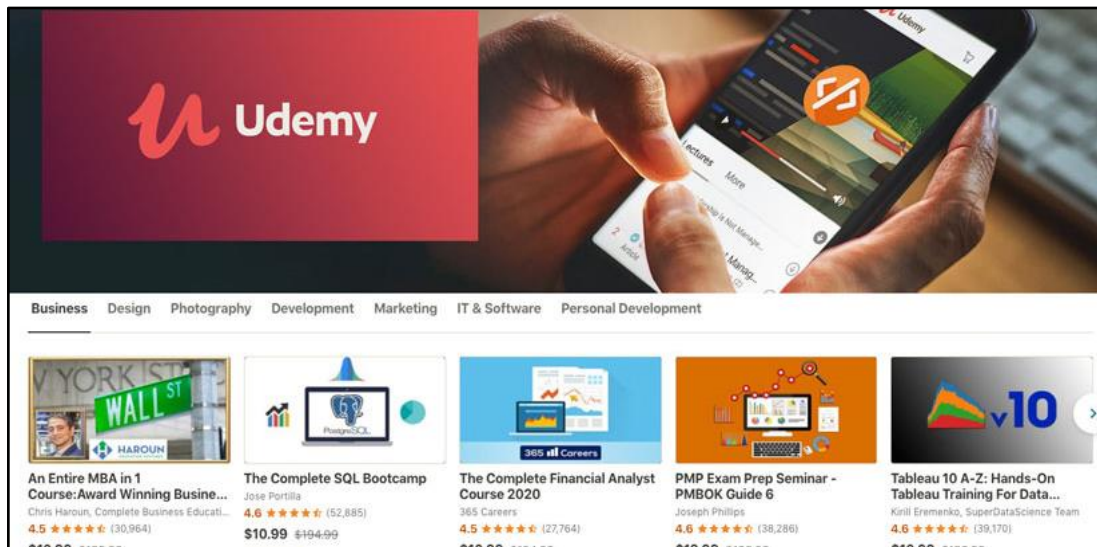


Figure 04 - Udemy

Udemy is a widely utilized online learning platform that offers a wide variety of courses across numerous subject topics. It allows tutors and instructors to create courses and to sell courses on a wide range of skill development topics. Users can access courses on-demand, enabling them to learn at their own pace and at their own comfort. Listed below are some drawbacks noticed in Udemy with regard to the Sri Lankan context.

1. It can be tedious for local tutors to stand out and attract students on a global platform as it is dominated by more established global instructors, making it harder to monetize their course content.
2. There are some outdated courses leading to outdated course information.

3. Specification and Design

3.1 Specification

3.1.1 Feasibility Study

SkillSync is an all-in-one platform that connects learners and tutors seamlessly and efficiently. It allows users to engage in courses, earn certifications, and complete skill-based quizzes to improve their skills. The platform supports tutors in sharing their expertise by creating a wide range of courses, including service listing features and an AI language model for providing quick assistance to skill-related questions, enhancing learning and teaching experiences. Let's delve deeper into the feasibility analysis of SkillSync across technical, economic, operational, and social/environmental dimensions.

3.1.1.1 Technical Feasibility

SkillSync relies on cutting-edge web development technologies to bring its vision to life. Utilizing React.js for front-end development, along with backend frameworks such as Node.js with Express.js, our platform ensures a robust and responsive user interface. These technologies enable seamless interaction between users and the website, facilitating smooth navigation and efficient data processing. Additionally, MongoDB is used as our database solution, enabling efficient data storage and retrieval.

3.1.1.2 Operational Feasibility

The success of our SkillSync website depends on how accurately people use the platform and how well it fits with the ways of learning and improving skills to grow professionally. Listed below are some of the ways we choose to train our users.

1. Creation of simple, user-friendly guides and tutorials tailored related to the specific features of SkillSync, such as enrolling to courses, service listing, and participating in quizzes.

2. Hosting live webinars and adoption of recorded video tutorials on SkillSync's features, offering practical demonstrations and answering user questions in real-time.
3. Implementing a well-guided onboarding process for new users, exposing them through the key features of SkillSync one-by-one.
4. Providing comprehensive help documentation, FAQs, and a dedicated support team to assist users with any challenges they encounter while using SkillSync.

3.1.1.3 Economic Feasibility

The economic feasibility of SkillSync hinges on a thorough analysis of its costs and potential revenue streams. Development costs encompass expenses related to software development, server hosting, domain registration, and personnel. These costs may vary depending on the complexity of the application and the scale of development efforts.

To generate revenue, SkillSync uses various monetization strategies as listed below.

1. Charging for specific course enrolments, along with course instructors earning a share of it.
2. Partnering with relevant companies to display targeted advertisements and promotions on the website.
3. Charging for personalized coaching and career guidance.
4. Charging for premium models with tiered plans for premium content and features.
5. Earning commissions through referral programs.

3.1.1.4 Market Feasibility

Promoting SkillSync in Sri Lanka requires a targeted marketing approach that addresses the unique challenges and preferences of the local population. Here's the marketing plan we tailored to the Sri Lankan context:

1. Localized Content Marketing: Creating content in all three native languages such as Sinhala, Tamil, and English to cater to the diverse linguistic preferences of the local Sri Lankan population.

2. Partnerships with Local Institutions: Collaborating with universities, and institutions in Sri Lanka to promote SkillSync to their students and members.

3. Influencer Marketing: Partnering with local influencers, educators, and industrial experts in Sri Lanka to recommend SkillSync to their followers.

4. Targeted Digital Advertising: Utilize targeted digital advertising on platforms such as Facebook, Instagram, and Google Ads to reach the Sri Lankan audience who is interested in education and career development.

5. Referral Program: Implement a referral program where existing users can receive rewards or discounts for referring new users to SkillSync.

3.1.2 Requirement Engineering

The Requirement Engineering (RE) process for the SkillSync project involves identifying, analysing, documenting, and managing the needs and expectations of stakeholders to define the system's functionalities and constraints. Here's a breakdown of the Requirement Engineering process for the SkillSync website:

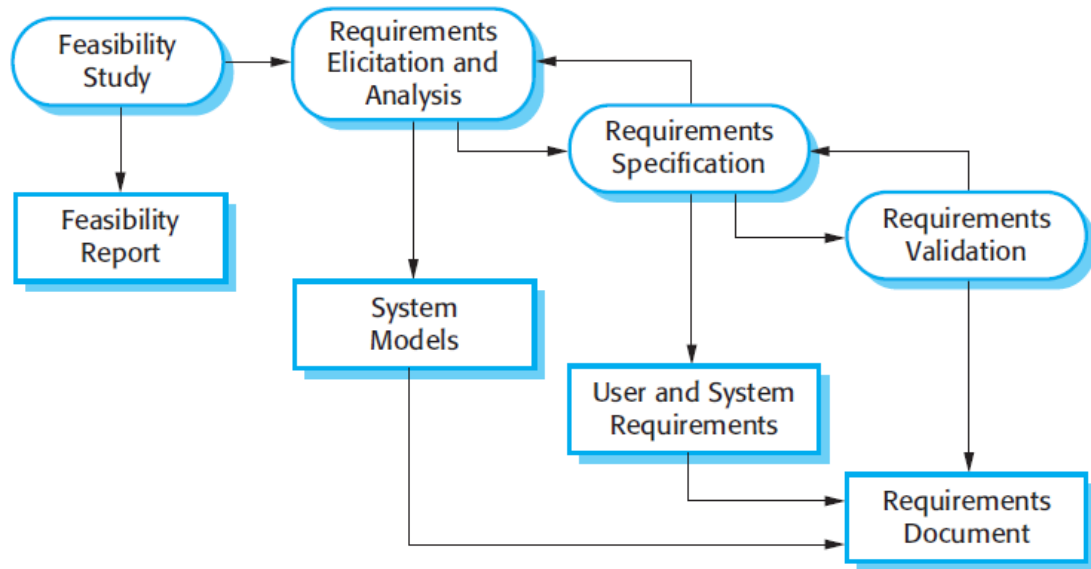


Figure 05 - Requirement Engineering Process [6]

1. Elicitation: This phase involves gathering requirements from various stakeholders, including end-users (learners), tutors, companies, project team members, the mentor and the internal supervisor. Techniques such as interviews, surveys, brainstorming sessions, and workshops were used to identify the user needs, requirements, and preferences related to the project.

2. Analysis: Once requirements are collected, they are analysed to identify any conflicting requirements, and the requirements are prioritized too. This phase involves understanding the context of use, defining system boundaries, and identifying dependencies between requirements.

3. Specification: In this phase, all the requirements that are significant for the project are documented in a clear, concise, and unambiguous way by using several techniques such as use cases, user stories, and requirement specifications. Each documented requirement is categorized based on its type such as functional or non-functional requirements and they are traced back to its source.

4. Validation: Validation ensures that the specified requirements accurately capture the project stakeholders' needs and expectations. We used several techniques such as prototyping, reviews, and walkthroughs, to validate the documented requirements with our stakeholders and ensure their alignment with the project's goals and objectives.

5. Verification: Verification ensures that our implemented system SkillSync meets the specified requirements. This involves comparing the actual system's behaviour against the documented requirements, conducting thorough testing, and addressing any variations, deviations or discrepancies discovered during the verification process.

6. Management: Requirement management phase involves maintaining, refining and controlling changes to the collected requirements throughout the entire project lifecycle. This contains version control, traceability management, impact analysis, and prioritization of changes based on their impact and significance.

3.1.3 Uniqueness of SkillSync

SkillSync is not just another educational web-based application. It's a comprehensive all-in-one solution designed to simplify and enhance the entire learning experience supporting career growth. With a wide range of key features and unique offerings, SkillSync stands out as a valuable tool among the existing solutions, for individuals seeking to polish their skills and advance in their career ladder. Listed below are some unique characteristics of SkillSync that set it apart from other platforms and existing solutions.

1. Extensive Multilingual Support: SkillSync offers courses and content in all three local languages in Sri Lanka such as Sinhala, Tamil, and English, addressing the diverse linguistic needs of Sri Lanka.

2. Instant AI-Driven Assistance: The seamless integration of the Gemini AI Language Model API within the platform enables users to have instant access to an AI

language model that provides crystal clear answers to skill-based questions, enhancing the learning experience further.

3. Earning Opportunities for Instructors: Our proposed platform allows Sri Lankan instructors to earn income through users enrolling in skill-based courses. Although many well-known global platforms exist, Sri Lankan tutors and instructors with expertise often face severe competition to stand out. SkillSync solely promotes local talent, helping local instructors showcase their skills and expertise and attract students to enrol to courses.

4. Mentorship Opportunities: The platform enables users to connect with mentors in their area of interest and expertise, providing guidance and assistance as they navigate their professional journey and career choices.

5. All-in-One Support: Our proposed platform SkillSync, offers comprehensive all-in-one support for both learners and instructors, combining educational materials, community engagement, and career growth in one platform. This unique approach offers users with everything they need from courses and quizzes to mentorship and job postings enhancing their learning journey and fostering industrial collaboration.

3.1.4 Functional Requirements

Functional requirements set the framework of any software system, defining its capabilities and functionalities. For SkillSync, the functional requirements are designed to provide users with a seamless and intuitive experience to enhance and polish their skills. Let's delve deeper into each of the functional requirements outlined for SkillSync.

1. FR-01: User Registration and Authentication

This feature allows users in our platform to create their own personal accounts, by providing their personal details such as username, password, full name, and contact information. Once logged in, the users can update their profile information too allowing them to manage their profiles.

2. FR-02: Course Instructor Registration

This feature allows course instructors in our platform to create their own personal accounts, by providing their personal details such as username, password, full name, and contact information. All the registered course instructors must be approved by the site administrator before they can login to their account, in order to ensure that only qualified instructors are permitted to sign in, teach, and earn from each course enrolment on the platform.

3. FR-03: Admin Panel

The admin panel of our platform contains a comprehensive list of students and course instructors, indicating the course instructors with pending approval as well as those who have been successfully approved. Additionally, the admin panel allows for the updating of administrator profile details and tracking of revenue generated from course enrolments.

4. FR-04: Skill-Based Quizzes

Our website consists of a diverse range of skill-based quizzes designed to promote active participation of users to develop their skills and to enhance their career growth. Users can choose their desired difficulty level such as beginner level, medium level, or expert level before taking the quizzes. To foster motivation and achievement, users who score above 60% receive a valuable credential, allowing them to progress through the quiz levels. This systematic approach not only rewards learners for their skill-developing efforts but also aids them track their progress as they polish their skills.

5. FR-05: Course Enrolment

When a user enrolls to a course, users will find a wide variety of options, including both free and paid courses created by course instructors approved by the site administrator. To facilitate secure and seamless transactions in our platform, we have integrated the Stripe payment gateway, allowing our users to have a smooth payment experience. Additionally, when a user successfully completes a course, he/she will receive a valuable certificate, showcasing their achievements.

6. FR-06: Integration of Artificial Intelligence (AI) Language Model

We've integrated the Gemini API into our website to provide users with instant assistance to an Artificial Intelligence (AI) language model that responds to skill-based questions by offering precise answers. This feature significantly enhances the learning experience in our platform by offering expert assistance across a wide range of skills areas and topics, ensuring that users have instant access to reliable information as they continue to develop their skills in our platform. Apart from integrating the Gemini API to our website, we also promptly tuned it in order to enable it to respond to skill-based questions only.

7. FR-07: Service Listing/Job Posting

Our platform also features a section that offers a space for users to list their services or job openings. We earn a profit from the user for each service listing, helping us maintain a valuable and sustainable service. Examples include collaboration on freelance projects, volunteer opportunities, and job openings.

8. FR-08: Rating and Review System

Our platform also enables users to rate the course instructor by selecting one to five stars, reflecting his/her satisfaction with the tutor's teaching in the course video series. This helps future students find the best course instructor and ensures high-quality instruction.

9. FR-09: Feedback Mechanism

Our platform also enables users to type their feedback about the course instructor, his/her courses or about our website, which will be displayed on the landing page of our platform. This greatly enables the future students to read reviews and gain insights into the quality of tutoring and the overall experience.

10. FR-10: Issuing of Course or Quiz Completion Badges and Certificates

Certificates will be generated upon completion of each course, and a valuable badge will be awarded after finishing each quiz. This ensures that your achievements are recognized and documented as users progress through their learning journey.

3.1.5 Non-Functional Requirements

Apart from functional requirements, SkillSync must also adhere to several non-functional requirements to ensure optimal performance, user satisfaction, and security.

1. NFR-01: Performance

The system is designed to ensure swift loading times and faster responses to user actions, giving an uninterrupted user experience even when there are peak traffic periods.

2. NFR-02: Scalability

The system's architecture is designed to be scalable to accommodate increasing user demands without affecting its performance.

3. NFR-03: Availability

The system is developed in a manner to maintain high availability, with minimal downtime to offer uninterrupted access for users.

4. NFR-04: Data Security

The system is developed to implement robust data security measures, with timely backups and resilient recovery mechanisms, to safeguard user data and ensure data integrity.

5. NFR-05: Inclusivity and Accessibility

The website's design should prioritize inclusivity, ensuring that individuals with disabilities can navigate and utilize the platform effectively.

6. NFR-06: Security

The system is designed to implement strong data encryption and secure authentication for user data protection. Also, user passwords are stored securely by using cryptographic hashing algorithms.

3.2 Design

Designing SkillSync involves creating a robust architecture that supports its key features and functionalities while ensuring scalability, performance, and usability. Let's break down the design considerations for SkillSync as follows:

3.2.1 User Interface (UI) Design

The user interface of SkillSync should be intuitive, visually appealing, user friendly and easy to navigate. A clean and modern design with intuitive navigation menus, clear call-to-action buttons, and interactive elements will enhance the overall user experience. The UI should also be responsive in design, flexibly adapting to different screen resolutions, sizes and devices, including desktops, laptops, tablets, and smartphones.

Using Figma, a powerful design tool for creating user interfaces, the UI for SkillSync was designed with the following considerations:

1. Navigation Bar: We started by designing a scalable navigation bar that remains visible at the top of the screen, providing easy access to essential sections of the website such as home, about, courses, contact, login quiz, blog and service listing. We also ensured that the navigation is minimal, clear and concise, with recognizable and meaningful icons or labels for each section.

2. Homepage Layout: We designed a visually appealing and intuitive homepage layout that showcases user's feedback, registered tutors, and user testimonials. We have included vibrant images and appealing content to capture the attention of users landing on our website.

3. Course Filter: We have incorporated an advanced search bar in our courses page, allowing users to quickly search for courses based on their preferences, including auto-suggestions and filters to streamline the search process.

4. Responsive Design: Our UI design is highly responsive and it adapts flexibly to different screen sizes, resolutions and devices. We used Figma's responsive design capabilities along with best practices to create layouts which scale proportionally across desktops, laptops, tablets, smartphones and other devices.

5. Visual Design Elements: We have incorporated several visual design elements such as colour schemes, typography, icons, and graphics that align with the brand settings of SkillSync. We have also utilized consistent branding elements throughout the UI to create an intuitive user experience.

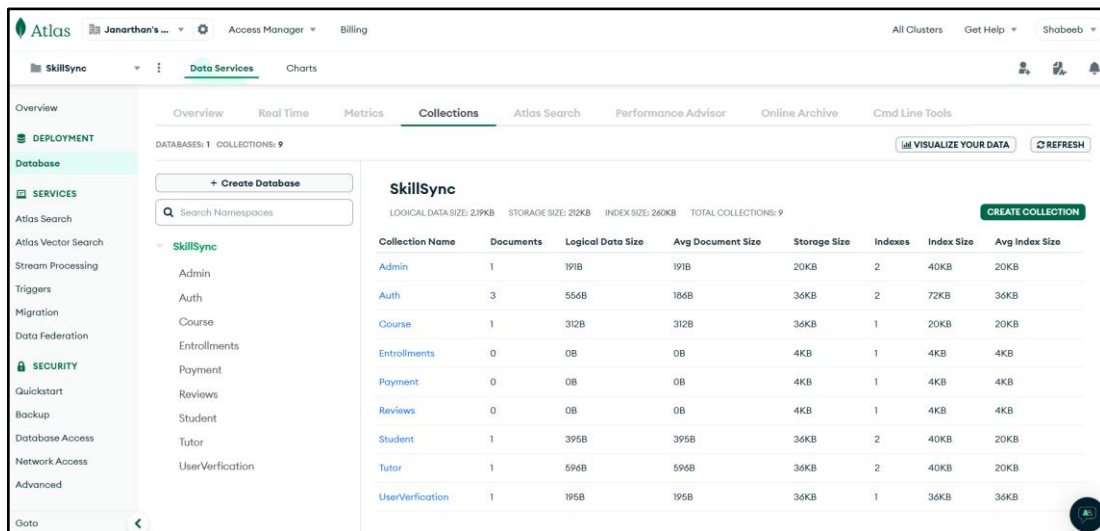
6. Interactive Elements: We have added several interactive elements in SkillSync such as buttons, sliders, checkboxes, and dropdown menus to enhance user interaction and experience. We used hover effects, transitions, and animations as per the necessity to provide feedback on each action taken by the users and to guide users through the interface.

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Figure 06 - Figma UI

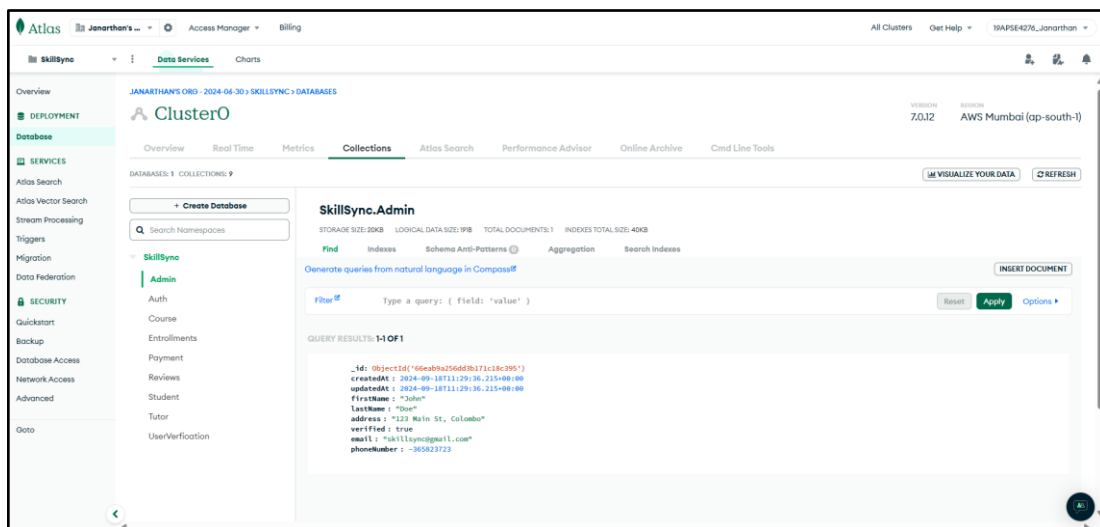
3.2.2 Database Design [7]

We created a well-structured database using MongoDB for storing all the data related to admin, authentication, courses, enrolments, payments, reviews, students, instructors or tutors, user verification, and other relevant data. The database design is greatly optimized for performance, with efficient data retrieval and storage mechanisms. All the relevant collections were properly normalized to minimize redundancy and ensure data consistency.



The screenshot shows the MongoDB Atlas interface for the 'SkillSync' database. The 'Collections' tab is active, displaying a table of collections. The table has columns for Collection Name, Documents, Logical Data Size, Avg Document Size, Storage Size, Indexes, Index Size, and Avg Index Size. The collections listed are Admin, Auth, Course, Enrollments, Payment, Reviews, Student, Tutor, and UserVerification.

Collection Name	Documents	Logical Data Size	Avg Document Size	Storage Size	Indexes	Index Size	Avg Index Size
Admin	1	191B	191B	20KB	2	40KB	20KB
Auth	3	556B	186B	36KB	2	72KB	36KB
Course	1	312B	312B	36KB	1	20KB	20KB
Enrollments	0	0B	0B	4KB	1	4KB	4KB
Payment	0	0B	0B	4KB	1	4KB	4KB
Reviews	0	0B	0B	4KB	1	4KB	4KB
Student	1	395B	395B	36KB	2	40KB	20KB
Tutor	1	596B	596B	36KB	2	40KB	20KB
UserVerification	1	195B	195B	36KB	1	36KB	36KB



The screenshot shows the MongoDB Atlas interface for the 'SkillSync.Admin' collection. The 'Admin' collection is selected, and the 'Find' tab is active. The 'Query Results' section displays a single document with the following fields: _id, createdAt, updatedAt, firstName, lastName, address, verified, email, and phoneNumber.

Field	Value
_id	objectId('66ebba756d8b171c18c395')
createdAt	2024-09-18T11:29:36.215+00:00
updatedAt	2024-09-18T11:29:36.215+00:00
firstName	"John"
lastName	"Doe"
address	"123 Main St, Colombo"
verified	true
email	"john.doe@skillsync.com"
phoneNumber	"905823723"

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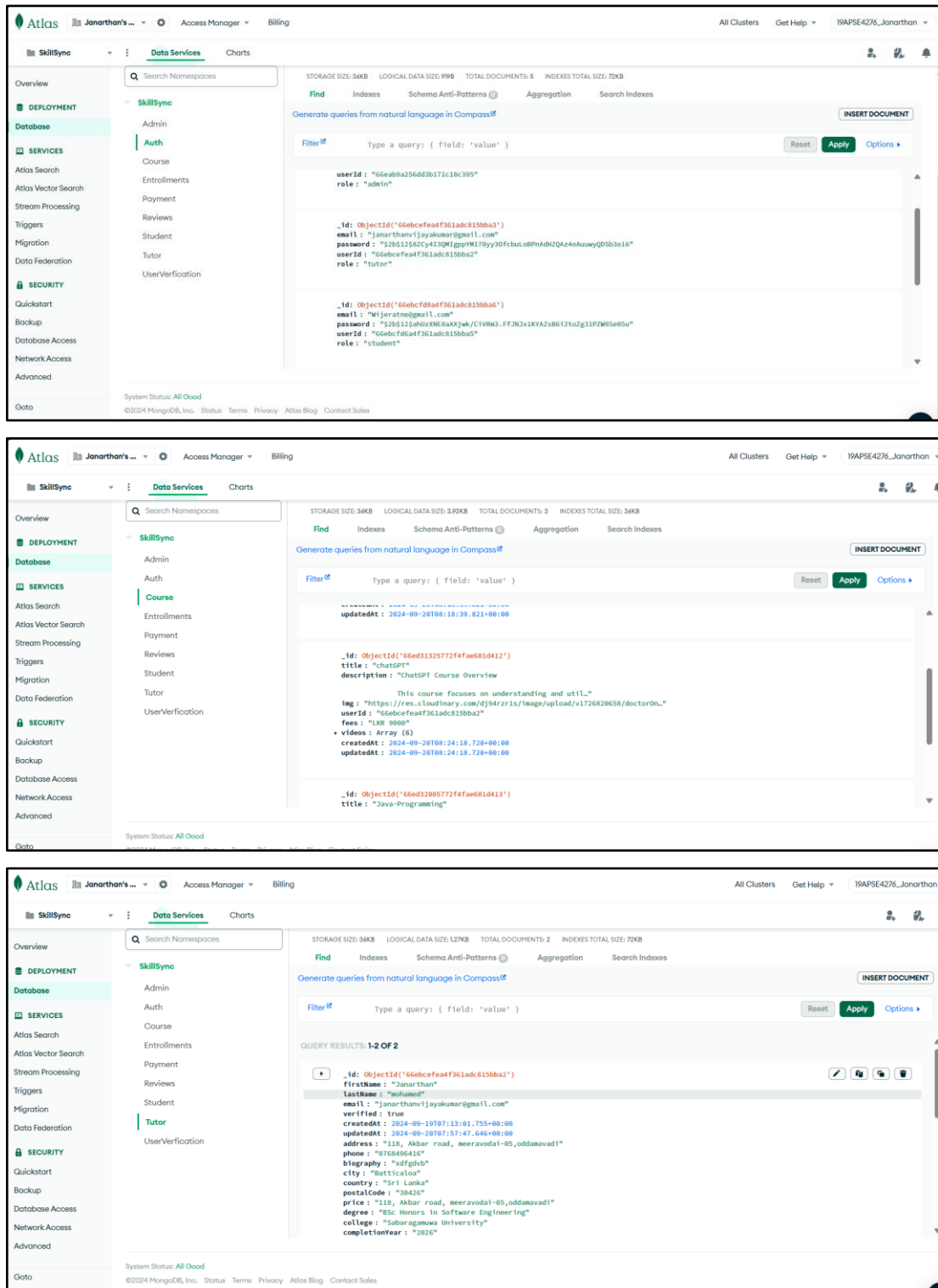


Figure 07 - Snapshots of the SkillSync MongoDB Database Collections

3.2.3 Backend Architecture Design

In the design of SkillSync's back-end architecture, scalability, reliability, and security will be considered. The system shall be modularized into smaller services that can independently be deployed by implementing a microservices architecture. User sign-up, course recommendations, tutoring services, consultation guidance, internship support, and feedback management of users will be assigned to independent services.

All of these services will be managed and scaled efficiently with the use of containerization technologies such as Docker, along with orchestration platforms like Kubernetes. This allows SkillSync to scale with demand from users, while updates/maintenance can smoothly be performed without their notice; thus, it enhances the overall user experience.

3.2.4 API Design

SkillSync will expose RESTful APIs to enable smooth communication between its frontend and backend parts. Proper documentation of these RESTful APIs, following standard conventions with respect to resource naming, HTTP methods, request and response formats, authentication, and error handling, is necessary. Where the resources are protected, one would implement mechanisms such as OAuth 2.0 to ensure users have a proficient and secure way of managing their data and interactions within the platform.

3.2.5 Integration with External Services

External services and APIs will also integrate with SkillSync to enhance its functionality. This includes contact with Gmail, map integration and real time data resources for chatbot that have been made through third-party services, as well as user notifications provided by third-party services. Utilization of APIs of leading providers in these areas will ensure seamless integrations in real-time data to enrich the user experience and comprehensive support for educational and career development services.

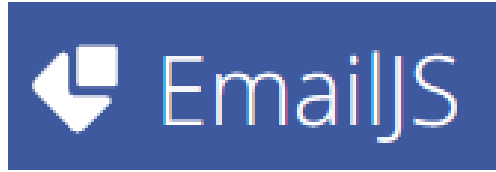


Figure 08 - EmailJS API



Figure 09 - Map API



Figure 10 - Gemini API

1. EmailJS API [8]

The EmailJS API allows developers to send emails from client-side JavaScript applications with third-party services like Gmail. What the API does is save your headache in setting up email functionality in web applications without needing code on the server side. Integrating the EmailJS API into SkillSync will make it easier for its users to reach support or even send inquiries through a contact form. The messages will be able to reach a specified email address through Gmail and this will ensure effective communication with the users for support.

2. Google Cloud API for Maps [9]

The Google Cloud API for Maps provides developers with access to Google Maps' functionality and data, enabling the integration of interactive maps into applications. It offers features such as displaying locations, routes, directions, and points of interest. By incorporating the Google Cloud API for Maps into SkillSync, users can visualize their career development paths, explore educational opportunities, and plan their

learning journeys more effectively using interactive maps with markers, overlays, and custom styling.

3. Gemini API for ChatBot [10]

It allows developers, through the Gemini API for ChatBot, to create very advanced conversational agents that can naturally and interactively communicate with users. This will enable developers to build, train, and deploy chatbots that can understand and respond to user queries in real time. With the integration of the Gemini API into SkillSync, it enables an AI-powered chatbot to offer support on a personal level, answering questions with regard to career development, offering suggestions of educational resources, and all in real time. This leads to an increase in user engagement and ensures learners that guidance will be afforded timely in the course of learning.

3.2.6 Security Design [11]

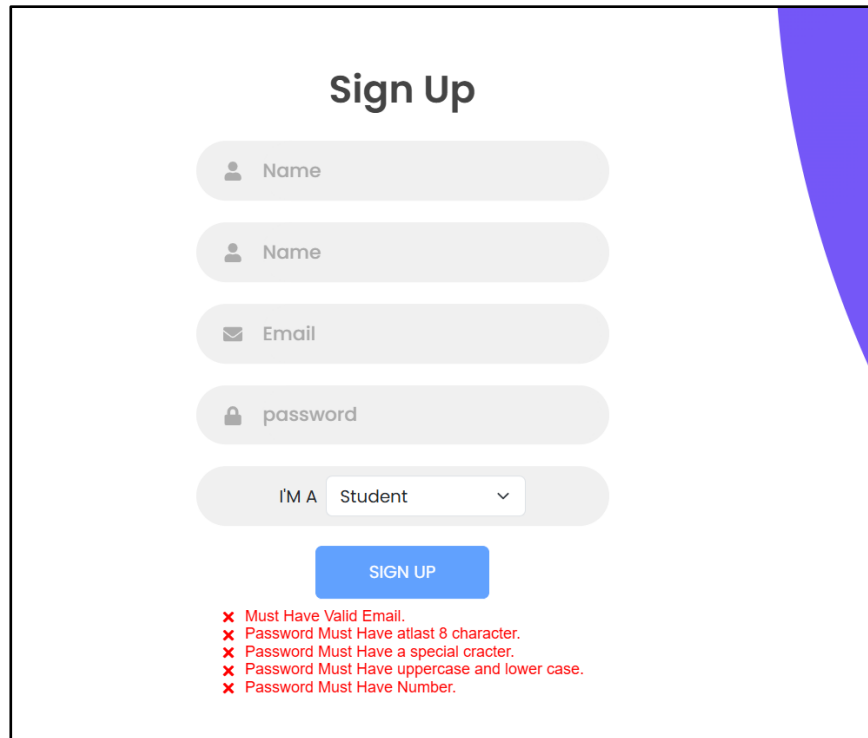
SkillSync should be designed with security at its core, making it hard for unauthorized access to user data and reducing the possibility of security threats. To develop a robust framework, security shall be enabled with respect to data encryption, HTTPS protocol, secure authentication mechanisms-OAuth and/or JWT-input validation, parameterized queries, and RBAC. These are necessary steps in order to avoid basic security vulnerabilities in the application.

One of the very crucial security levels is at the time of sign-up or sign-in, not allowing vacant or incomplete credentials. This means that because of this rule enforced on the system, no user should be able to create an account or log in with partial or irrelevant information, hence reducing the risk of unauthorized access and fraud.

At the time of registration, SkillSync should prompt a user to enter all information required at the time of registration, including username, e-mail address, and password. In turn, this needs to confirm that it has filled the fields before it allows the user to proceed. In that regard, during the process of sign-in, it checks that a user has valid credentials, after which the access of an account is granted.

Meeting these requirements means the database of users can be assured to stay reliable and trustworthy, their accounts are well-protected from any potential security vulnerability, and brute-force attacks or unauthorized access can be prevented. This ensures a slick and seamless user experience, guiding a user through the registering and authentication process flawlessly.

In the SkillSync, during the sign-in to the system, the extra verification implemented by the admin will ensure that only verified tutors get access to the features meant for a tutor. The registration process will provide necessary information about the qualifications, expertise, and relevant documentation by the would-be tutors. This information will be reviewed by the admin for the verification of his tutoring credentials, thus ensuring that only the right people tutor or guide through the platform. The admin then verifies the information of the tutor and approves his account, hence allowing him access to the functionalities for a tutor on SkillSync. Here, any tutor who tries to log in will have the system check his verification status and allow only those tutors to log in who have been verified by the admin. This will help you maintain quality tutoring services within your SkillSync community and further build a more trustworthy and reliable community.



The form is titled "Sign Up" and contains five input fields: two for "Name", one for "Email", and one for "password". Below these is a dropdown menu labeled "I'M A" with "Student" selected. A blue "SIGN UP" button is positioned below the dropdown. At the bottom, there are five red error messages, each preceded by a red 'X' icon.

Sign Up

Name

Name

Email

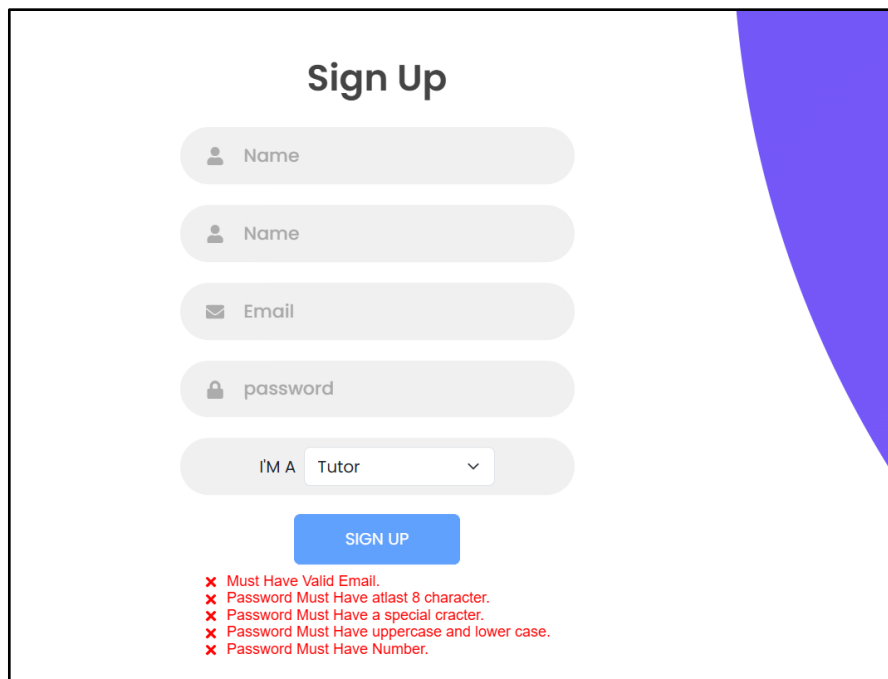
password

I'M A Student

SIGN UP

- ✗ Must Have Valid Email.
- ✗ Password Must Have atleast 8 character.
- ✗ Password Must Have a special cracter.
- ✗ Password Must Have uppercase and lower case.
- ✗ Password Must Have Number.

Figure 11 - Unfilled Sign-Up as Student



The form is titled "Sign Up" and contains five input fields: two for "Name", one for "Email", and one for "password". Below these is a dropdown menu labeled "I'M A" with "Tutor" selected. A blue "SIGN UP" button is positioned below the dropdown. At the bottom, there are five red error messages, each preceded by a red 'X' icon.

Sign Up

Name

Name

Email

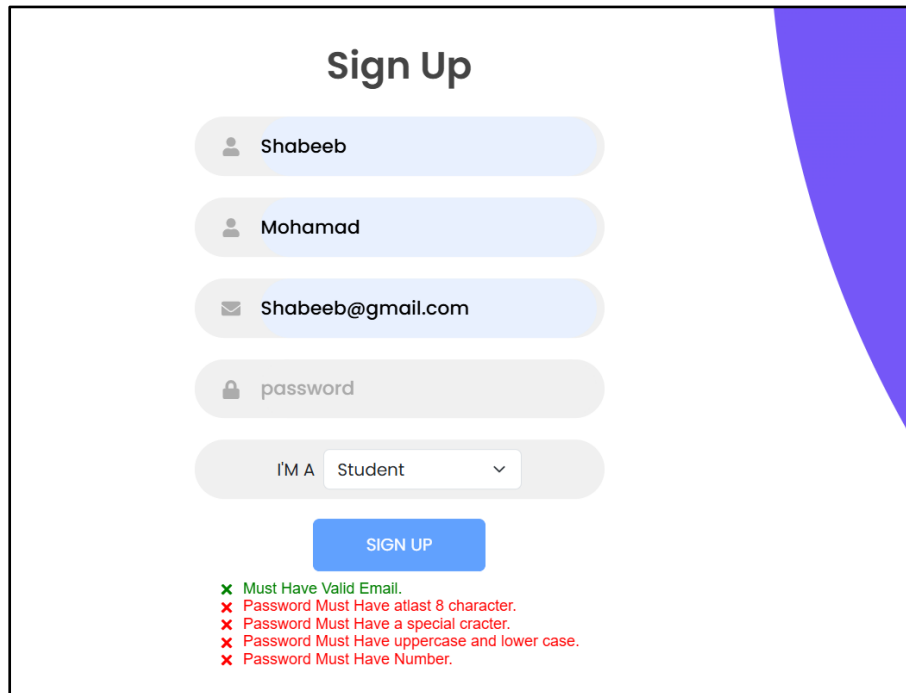
password

I'M A Tutor

SIGN UP

- ✗ Must Have Valid Email.
- ✗ Password Must Have atleast 8 character.
- ✗ Password Must Have a special cracter.
- ✗ Password Must Have uppercase and lower case.
- ✗ Password Must Have Number.

Figure 12 - Unfilled Sign-Up as Tutor



The image shows a 'Sign Up' form with a light blue header and a purple decorative corner. The form contains five input fields: two for names (Shabeeb and Mohamad), one for email (Shabeeb@gmail.com), one for password (password), and a dropdown menu for 'I'M A' with 'Student' selected. A blue 'SIGN UP' button is positioned below the fields. At the bottom, there are five error messages: a green message for 'Must Have Valid Email.' and four red messages for password requirements (at least 8 characters, special character, uppercase and lowercase, and number).

Sign Up

Shabeeb

Mohamad

Shabeeb@gmail.com

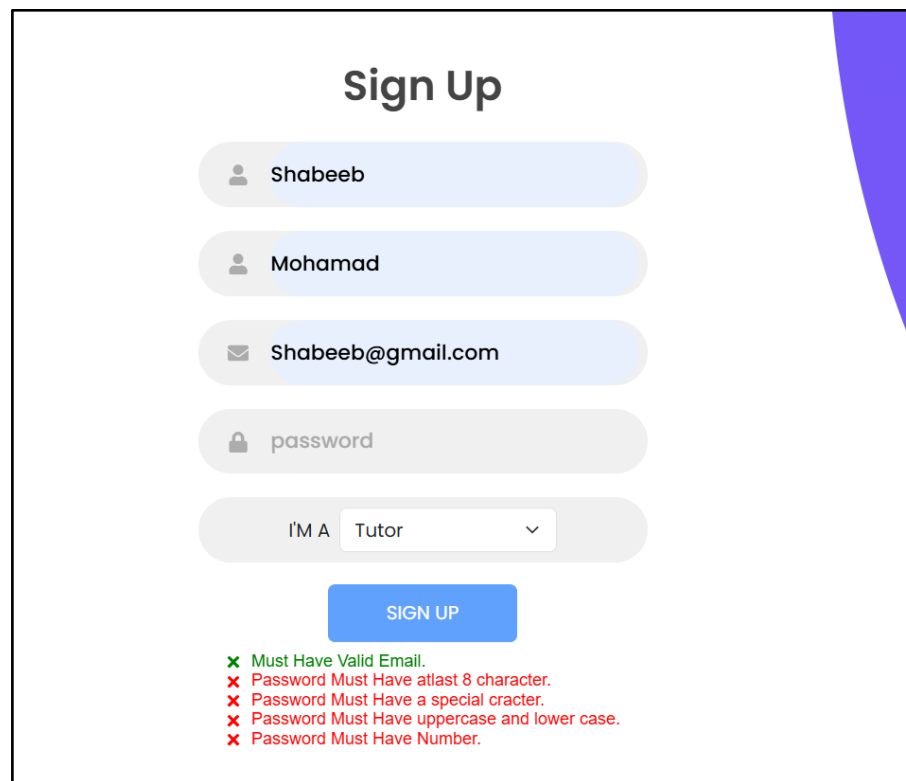
password

I'M A Student

SIGN UP

- ✗ Must Have Valid Email.
- ✗ Password Must Have atleast 8 character.
- ✗ Password Must Have a special cracter.
- ✗ Password Must Have uppercase and lower case.
- ✗ Password Must Have Number.

Figure 13 - Unfilled Password Sign-Up as Student



The image shows a 'Sign Up' form similar to Figure 13, but with 'Tutor' selected in the 'I'M A' dropdown menu. The error messages at the bottom are identical to those in Figure 13.

Sign Up

Shabeeb

Mohamad

Shabeeb@gmail.com

password

I'M A Tutor

SIGN UP

- ✗ Must Have Valid Email.
- ✗ Password Must Have atleast 8 character.
- ✗ Password Must Have a special cracter.
- ✗ Password Must Have uppercase and lower case.
- ✗ Password Must Have Number.

Figure 14 - Unfilled Password Sign-Up as Tutor

Sign Up

Shabeeb

Mohamad

Shabeeb@gmail.com

.....

I'M A

Student

SIGN UP

✓ Must Have Valid Email.

✓ Password Must Have atleast 8 character.

✓ Password Must Have a special cracter.

✓ Password Must Have uppercase and lower case.

✓ Password Must Have Number.

Figure 15 - Without Uppercase - Password Sign-Up

Sign Up

Shabeeb

Mohamad

Shabeeb@gmail.com

.....

I'M A

Tutor

SIGN UP

✗ Must Have Valid Email.

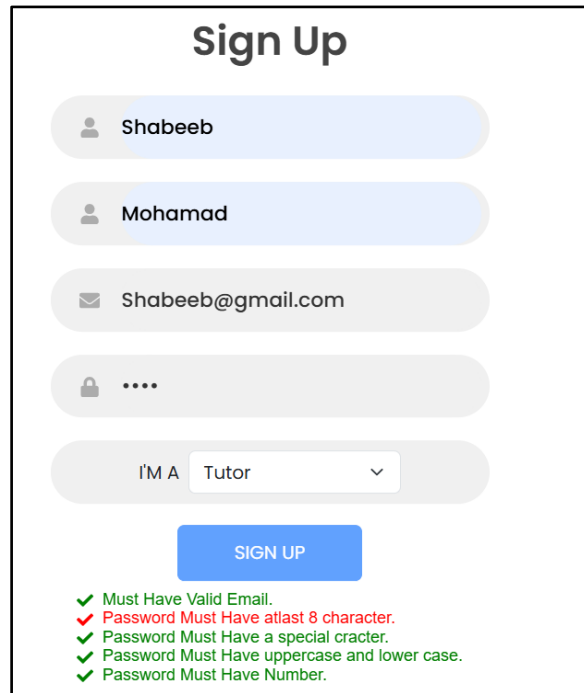
✗ Password Must Have atleast 8 character.

✗ Password Must Have a special cracter.

✗ Password Must Have uppercase and lower case.

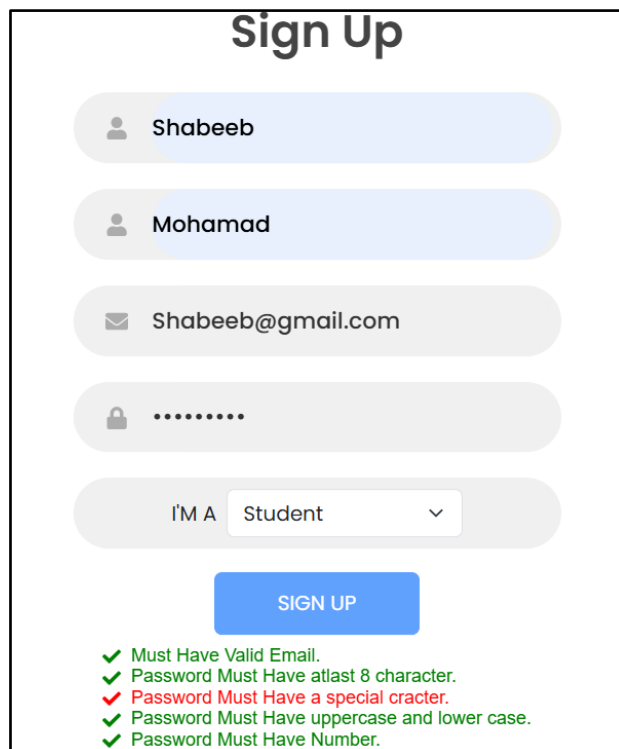
✗ Password Must Have Number.

Figure 16 - Without a Number - Password Sign-Up



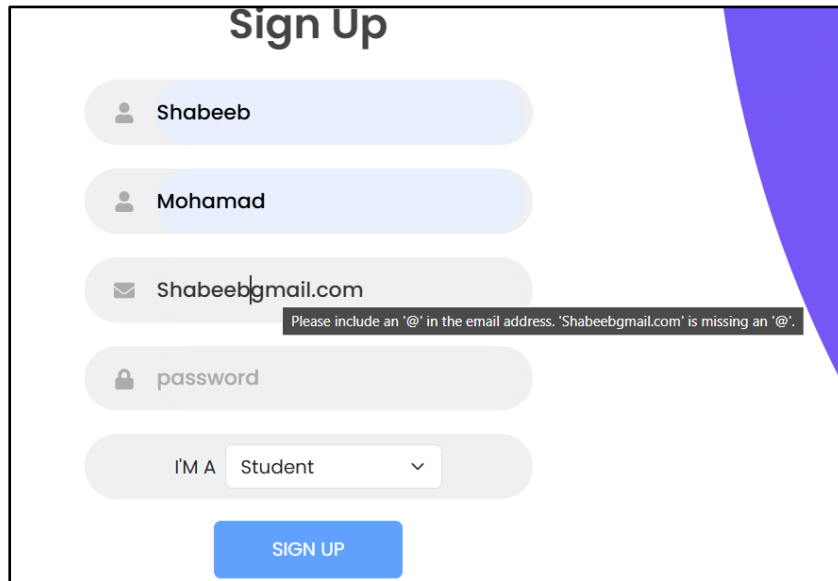
The image shows a 'Sign Up' form with the following fields: a first name field containing 'Shabeeb', a last name field containing 'Mohamad', an email field containing 'Shabeeb@gmail.com', and a password field with masked characters '....'. Below the password field is a dropdown menu labeled 'I'M A' with 'Tutor' selected. A blue 'SIGN UP' button is positioned below the dropdown. At the bottom, there is a list of validation messages: a green checkmark for 'Must Have Valid Email.', a red checkmark for 'Password Must Have atleast 8 character.', a green checkmark for 'Password Must Have a special cracter.', a green checkmark for 'Password Must Have uppercace and lower case.', and a green checkmark for 'Password Must Have Number.'

Figure 17 - Without 08 Characters - Password Sign-Up



The image shows a 'Sign Up' form with the following fields: a first name field containing 'Shabeeb', a last name field containing 'Mohamad', an email field containing 'Shabeeb@gmail.com', and a password field with masked characters '.....'. Below the password field is a dropdown menu labeled 'I'M A' with 'Student' selected. A blue 'SIGN UP' button is positioned below the dropdown. At the bottom, there is a list of validation messages: a green checkmark for 'Must Have Valid Email.', a green checkmark for 'Password Must Have atleast 8 character.', a red checkmark for 'Password Must Have a special cracter.', a green checkmark for 'Password Must Have uppercace and lower case.', and a green checkmark for 'Password Must Have Number.'

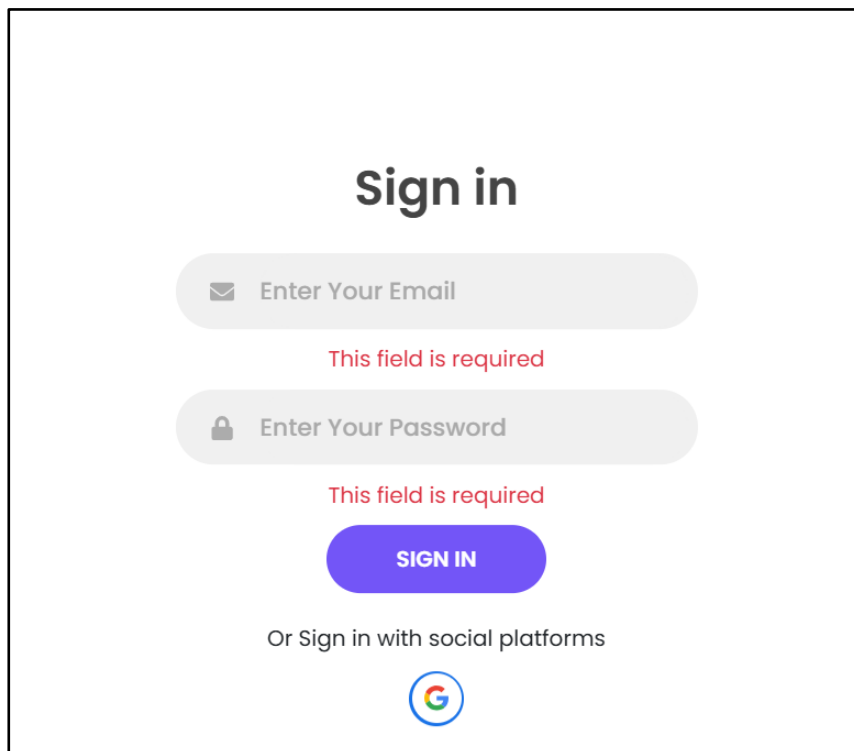
Figure 18 - Without Special Characters - Password Sign-Up



The image shows a 'Sign Up' form with the following fields and elements:

- Sign Up** (Section Header)
- First Name:** Shabeeb
- Last Name:** Mohamad
- Email:** Shabeebgmail.com. A validation error message is displayed below the field: "Please include an '@' in the email address. 'Shabeebgmail.com' is missing an '@'."
- Password:** password
- I'M A:** Student (dropdown menu)
- SIGN UP** (Button)

Figure 19 - Missing Part Following '@' in Email Address



The image shows a 'Sign in' form with the following fields and elements:

- Sign in** (Section Header)
- Enter Your Email** (Field with placeholder text). Below the field, a red message states: "This field is required".
- Enter Your Password** (Field with placeholder text). Below the field, a red message states: "This field is required".
- SIGN IN** (Button)
- Or Sign in with social platforms** (Text)
- Google logo** (Icon for social login)

Figure 20 - Unfilled Sign-in as Student or Tutor

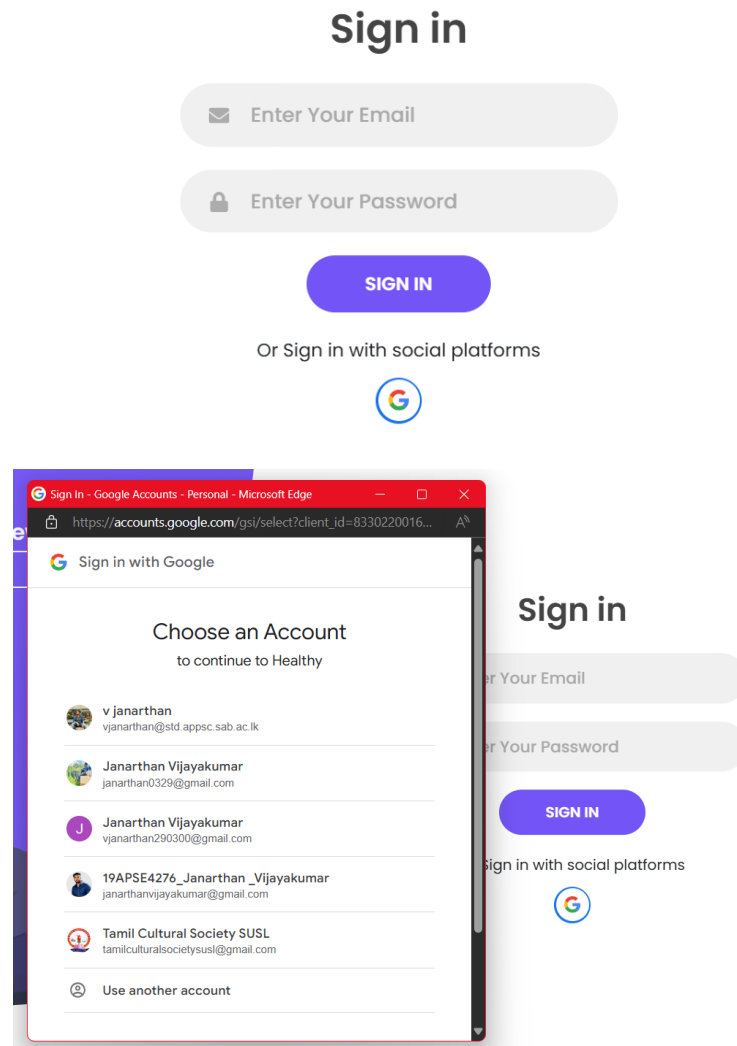


Figure 21 - Sign in with google accounts



Figure 22 - Hashing of User Password

We have implemented a password hashing procedure to enhance user security in our platform. When a user registers with our application, their password is securely hashed before being stored in our MongoDB database. This practice ensures that the password cannot be decrypted and viewed even if the database is compromised in any situation.

When a user sign-in, the password entered to the platform by the user is hashed using the same algorithm and it is compared with the stored hashed password. If both the hashes match, the user will be granted to access the system.

Additionally, we created an admin panel separately to enhance the security further. Only those who know the endpoint is granted the access to the admin panel, further protecting sensitive operations from unauthorized access. By using hashed passwords and a secure admin panel, we are committed to safeguarding user information and mitigating common security threats.

3.2.7 Scalability and Performance

SkillSync is designed to handle a large volume of users and concurrent user requests while maintaining optimal performance. We aim to achieve horizontal scalability by deploying the application across multiple servers or cloud instances and using load balancers to distribute incoming traffic without any issues. Caching mechanisms, content delivery networks (CDNs), and database sharding can further improve performance and scalability.

3.2.8 Testing and Quality Assurance [12]

Rigorous testing and quality assurance processes should be implemented throughout the development lifecycle of SkillSync. This includes several types of testing such as unit testing, integration testing, system testing, acceptance testing, regression testing, and performance testing to detect and fix bugs, ensure functional correctness, and optimize performance. Automated testing frameworks and continuous integration/continuous deployment (CI/CD) pipelines can streamline the testing process and ensure the reliability and stability of the application.

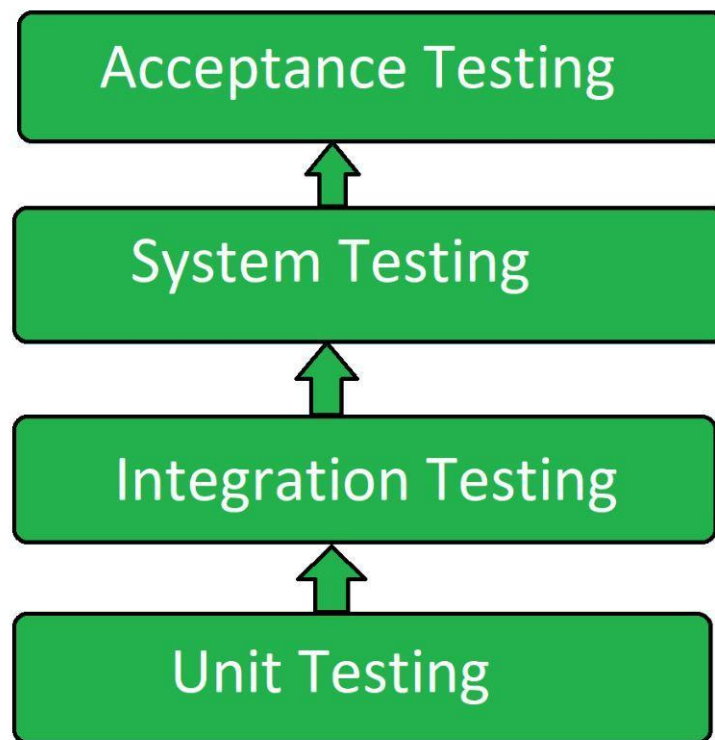


Figure 23 - Testing Stages [13]

1. Unit testing: Unit testing involves the process of testing individual modules or components of our system in isolation to ensure they work correctly. For the SkillSync project, the following modules underwent unit testing.

1. User Management Module
2. Search and Filter Module
3. Course Enrolment Module
4. Skill Assessment Module
5. Service Listing Module
6. Rating and Review Module
7. Admin Panel Module
8. Payment Processing Module

2. Integration Testing: Integration testing involves the process of testing the interaction between different modules or components in our platform, to ensure they

work together collectively as expected. This includes checking that data is passed correctly among the modules, APIs are integrated smoothly, and dependencies are managed systematically.

3. System Testing: System testing involves the process of testing the entire application as a whole to validate that it meets the specified requirements and functions correctly. This involves testing all features and functionalities of SkillSync across different platforms and browsers to detect any bugs, defects or inconsistencies.

4. Acceptance Testing: Acceptance testing involves the process of validating the application against the documented requirements and actual user expectations. This significant testing phase ensures that SkillSync meets the needs of its intended users and fulfills its intended purpose. It may involve user acceptance testing (UAT) where real users or stakeholders interact with the application to provide feedback and validate its usability.

Test Cases

Test Scenario ID		Test Case ID					
Test Case Description		Test Priority					
Pre-Requisite		Post-Requisite					
Test Execution Steps:							
S.No	Action	Inputs	Expected Output	Actual Output	Test Browser	Test Result	Test Comments

Figure 24 - Test Case Format

We utilized Postman API to rigorously test the backend functionality and APIs of the platform for the following test scenarios.

- User Registration and Login

- Search Functionality
- Admin Panel Functionality
- Addition, Modification and Deletion of Courses
- Mobile Responsiveness
- Scoring Logic of Quizzes

Example Test Case for Successful User Registration

Test Case Title : Verify the users can successfully register to the system

Test Case ID : TIP_TC_001

Test Priority : High

Test Description : This test case verifies that a user can successfully register to the SkillSync website.

Pre-Conditions : The system should be accessible and running.
The user should have valid data

Test Steps : Go to the SkillSync website.
Click on the login or sign-up button.
Input the user's name and the password.
Wait until the system processes the login request.

Expected Results :

- The system shows a message informing that the login was successful
- The user is navigated to the home page of the system

Post Conditions :

- The user is logged in to the system and has the accessibility to features and functionalities
- The session is active providing the user with sequences of actions inside the system even without asking to log in again.

Test Pass Criteria:

- The user can log in without facing any errors.
- The login section is accessible.

- A confirmation message is displayed upon successful sign-up and login.
- The scheduled lecture is visible in the system.

Test Fail Criteria:

- The user is unable to sign up and log in.
- The login section is not accessible.
- No confirmation message is displayed after signing up or logging in.

By following the waterfall model, you can systematically progress through each stage of development, ensuring that requirements are met and quality is maintained. Testing at each stage helps identify and address issues early in the development lifecycle, reducing the risk of costly errors and ensuring a successful final product.

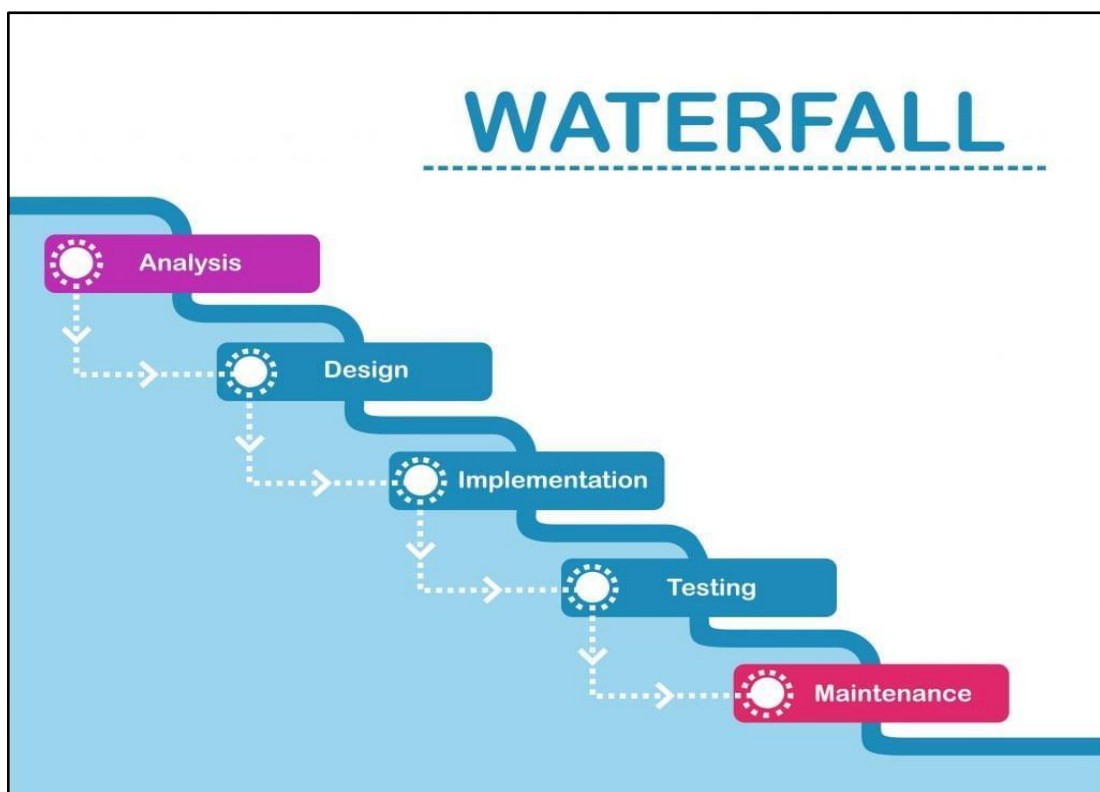


Figure 25 - Waterfall Model [14]

In summary, the design of SkillSync prioritizes usability, scalability, security, and performance to deliver a seamless experience for users. By adopting best practices in

UI design, database design, backend architecture, API design, security, scalability, and testing, SkillSync has become a robust and reliable platform for skill development.

3.3 Design with UML Diagrams

3.3.1 Use Case Diagram

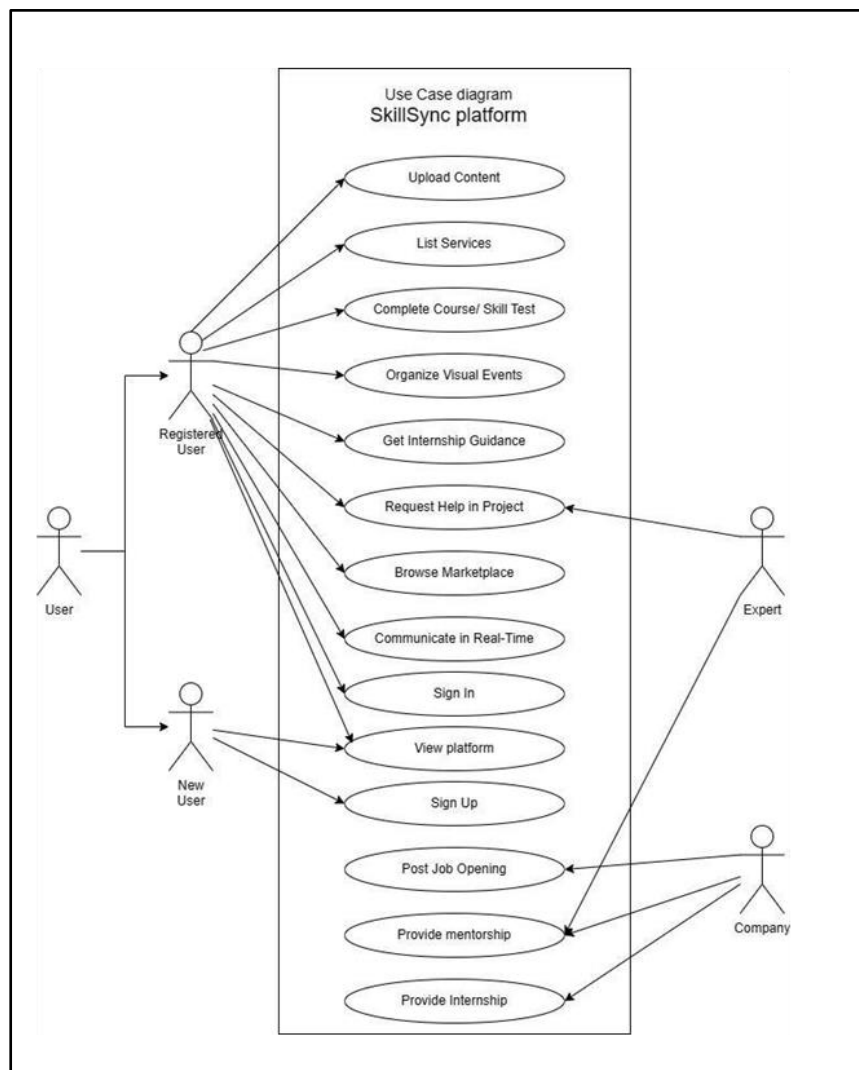


Figure 26 - User Case Diagram

3.3.2 ER Diagram

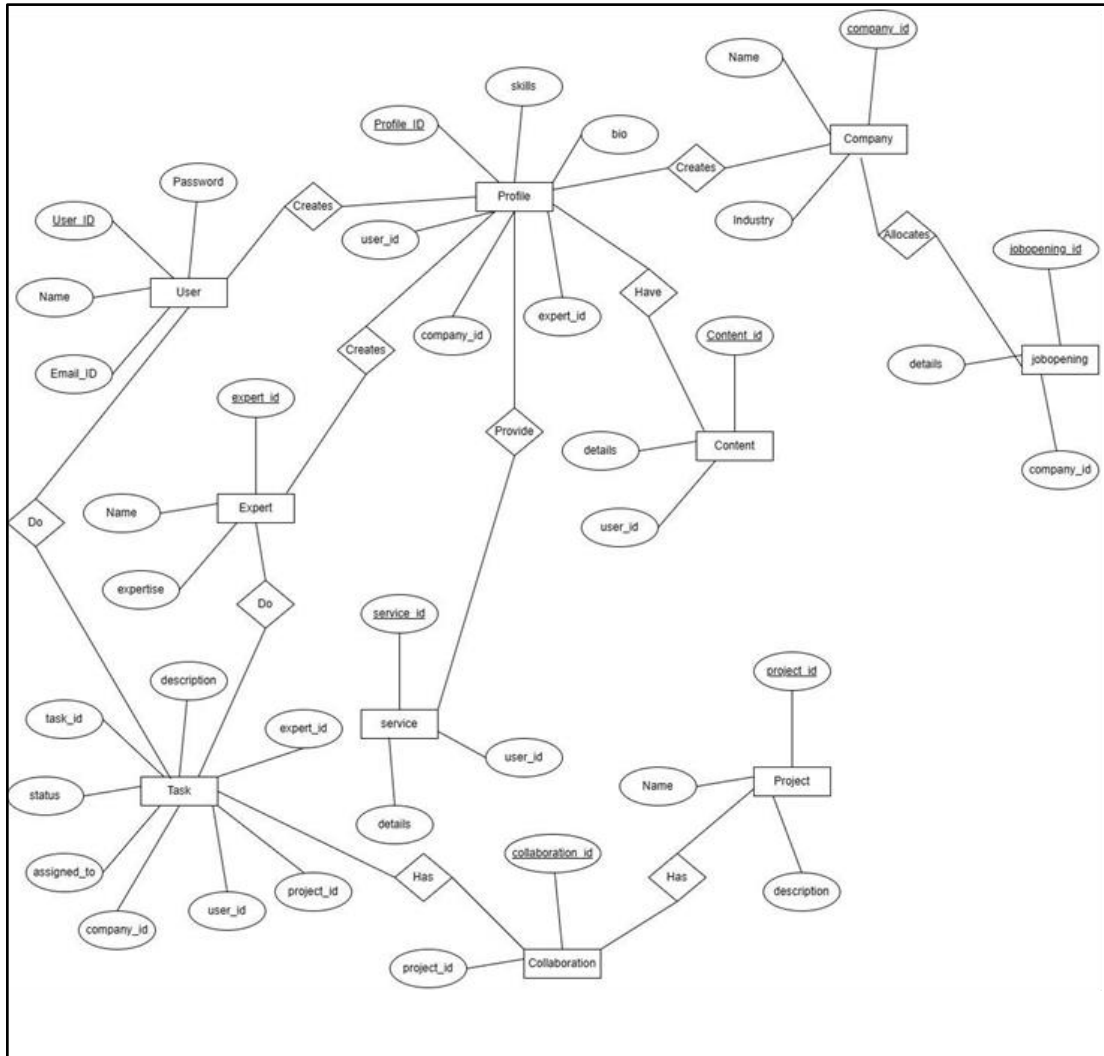


Figure 27 - Entity Relationship (ER) Diagram

3.3.3 DFD Diagram

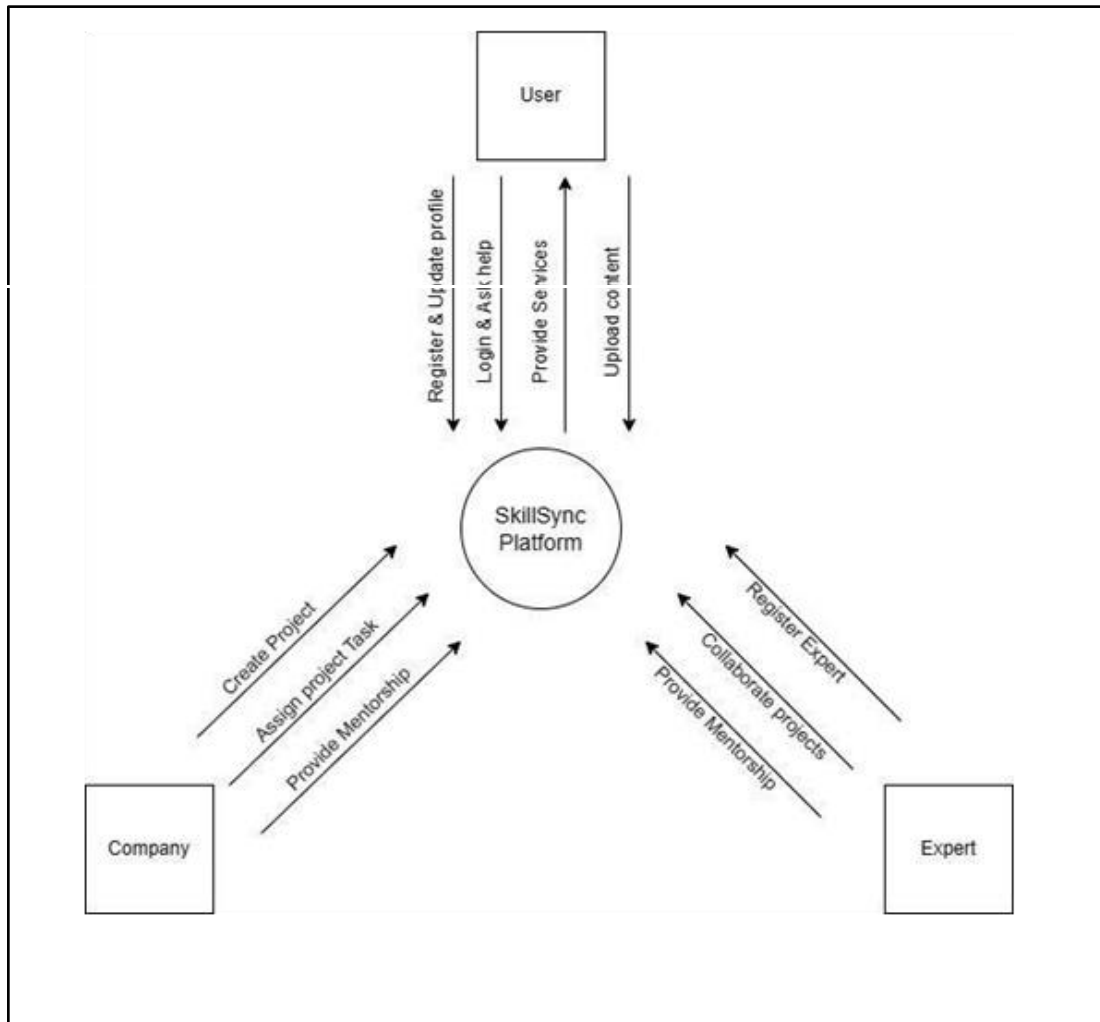


Figure 28 - Data Flow Diagram (DFD)

4. Implementation

SkillSync, by using the MERN stack - MongoDB, Express.js, React, and Node.js - provides a dynamic platform for education and career development. The users of this

application will have access to a wide array of resources, connect with several opportunities, uplift learning experiences through multilingual course offerings, personalized consultation services, project collaboration, and an intuitive user interface.

The frontend will be designed using **React** to provide a responsive and interactive user experience. Due to the component-based architecture of this tool, development and maintenance are possible in such a way that it would be very easy for users to navigate through the platform and perform various activities.

Node.js would serve as the runtime environment of the application, while **Express.js** would be used to manage the server side of the tool, including logic and routing. Express.js makes it very convenient to create RESTful APIs, handle communications between the frontend and backend, and manage different kinds of HTTP requests with ease.

It would be **MongoDB** for NoSQL database storage, which would store and manage data like user profiles, course materials, job postings, and feedback. This flexibility and scalability in MongoDB make it suitable to hold a wide array of data types as SkillSync evolves to meet users' needs with time.

This full MERN technology stack will enable SkillSync to create a smooth, efficient learning environment that will support users in their educational and career journeys.

Visual Studio Code, a popular integrated development environment (IDE), will serve as the primary tool for writing, editing, and debugging code. Its user-friendly interface, built-in Git integration, and extensive library of extensions make it ideal for software development projects.



Figure 29 - VS Code Logo

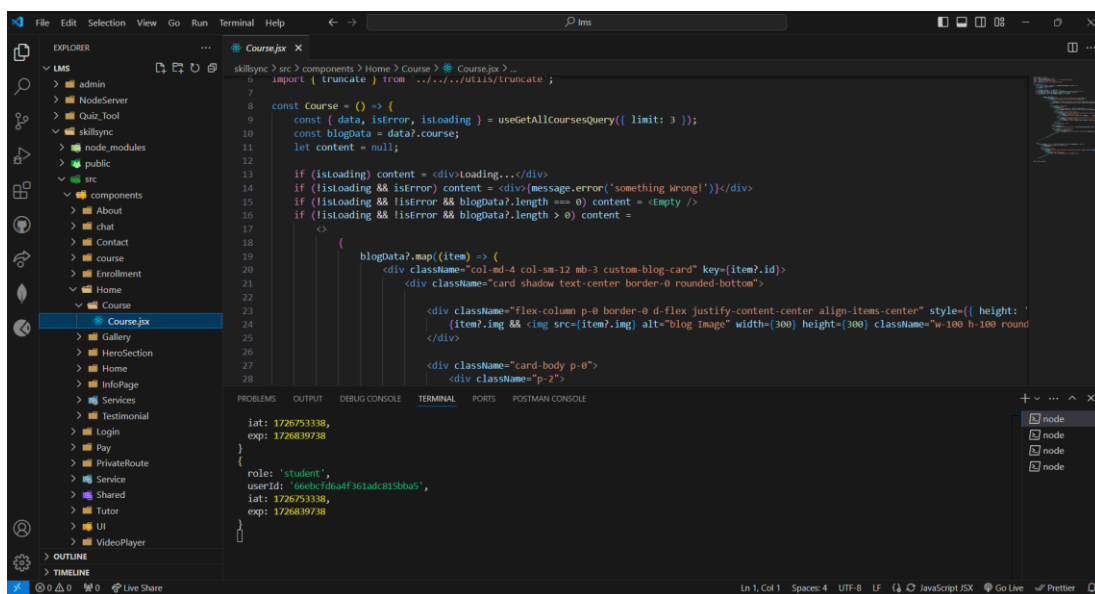


Figure 30 - VS Code UI

Overall, the integration of **SkillSync** in VS Code would cover both the sides-frontend and backend technologies, hence offering a smooth and user-friendly experience in education and career development. The application will be powered with React, Node.js, Express.js, and MongoDB to empower an end-user with one-stop-solution to connect them with learning resources and opportunities.

How to Implement SkillSync using the MERN Stack in Visual Studio Code:

1. Setting Up the Project

In your text editor, Visual Studio Code, open a new folder for SkillSync. Open up your terminal and initialize a new Node.js project by running ``npm init -y``. Install the required packages that include Express.js and Mongoose for MongoDB, and run ``npm install``.

2. Creating the Server

The development of the server side in Node.js using Express.js, which will handle all the routes returning HTTP requests and responses. It defines routes that cater to user authentication, course management, and job postings.

3. MongoDB Connection

Connect to the MongoDB database via Mongoose. Define the schema of data that will be stored for each model related to users, course materials, job postings, and feedback.

4. User Authentication Implementation

Prepare the authentication based on JSON Web Token and/or other mechanisms. Establish creation of user accounts, sign-in, and sign-out processes while making sure that access to the platform is secure.

5. Frontend

Using React, design the front-end side of SkillSync by developing the components that represent different features: course listing, user profiles, and feedback systems. Apply CSS to make the interface as attractive and interactive as possible. Also, apply JavaScript to perform client-side operations such as form validation and dynamic content rendering.

6. API Integration

Integrate Third-party APIs where the requirement be there, for instance, real-time data or to advance the functionality in any form. The response processing shall be done through sending requests in HTTP through JavaScript for ensuring that the information of the user is rich.

7. Core Feature Implementation

We developed the key features including uploading of contents, service listing, collaboration on projects, and consultation services. All features have to be user-friendly, easy to operate, and accessible.

8. Testing and Debugging

We made sure the application works by utilizing the built-in debugger and testing libraries in VS Code. We performed unit testing of both frontend and backend.

During the implementation process, we made full use of VSCode's capabilities in code editing, version control integrations, like Git, and other productivity and collaboration extensions in Visual Studio Code. Also, we paid attention to the best practices of organizing code for security and optimization of performance that will make sure the platform is robust and scalable to SkillSync.

4.1 Software and Hardware Requirements

4.1.1 Software Requirements

1. Operating System [15]

SkillSync should be installed on a compatible operating system server, for instance, Windows OS. In the near future, it is envisaged that SkillSync will support other platforms, such as Linux-based Operating Systems with Ubuntu or CentOS, and macOS servers to enhance its compatibility and flexibility.



Figure 31 - Windows Logo



Figure 32 - Linux Logo



Figure 33 - Mac OS Logo

2. Web Server [16]

A web server software such as Apache, Nginx, or Microsoft IIS is essential for handling requests from web browsers and delivering web pages for the SkillSync platform.



Figure 34 – Apache Logo



Figure 35 - NGINX Logo



Figure 36 - Microsoft IIS Logo

3. Database Management System (DBMS) [7]

We used the MongoDB server which would be a typical example of an NRDBMS, to handle user data, course materials, job listings, and other details of the application for SkillSync.



Figure 37 - MongoDB

4. Programming Languages [17]

In this regard, the server-side scripting languages used in the development of dynamic features and interactions on the platform are Node js and its framework, Express js, due to their flexibility.



Figure 38 - Node.js Logo



Figure 39 - Express.js Logo

5. Front-End Technologies [17]

We used React.js in addition to CSS and JavaScript in order to build the SkillSync platform's user interface. React will enable them to create dynamic and responsive components, enhancing user interactions and making sure experiences are seamless across devices.

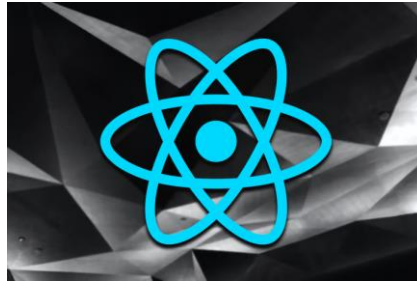


Figure 40 - React Logo



Figure 41 - CSS Logo



Figure 42 - JavaScript



Figure 43 - Bootstrap Logo

6. Integration with External Services [10] [8]

We established connections with external APIs or web services to enable functionalities such as AI language model integration, email template creation, etc. Listed below are some APIs that we used.

1. Gemini API
2. EmailJS API



Figure 44 - Gemini API Logo



Figure 45 - EmailJS API Logo

7. Version Control System

We used a version control system such as Git to manage the source code and to collaborate among team members working on the project.



Figure 46 - GitHub Logo

Mini Project - Final Report - 2024

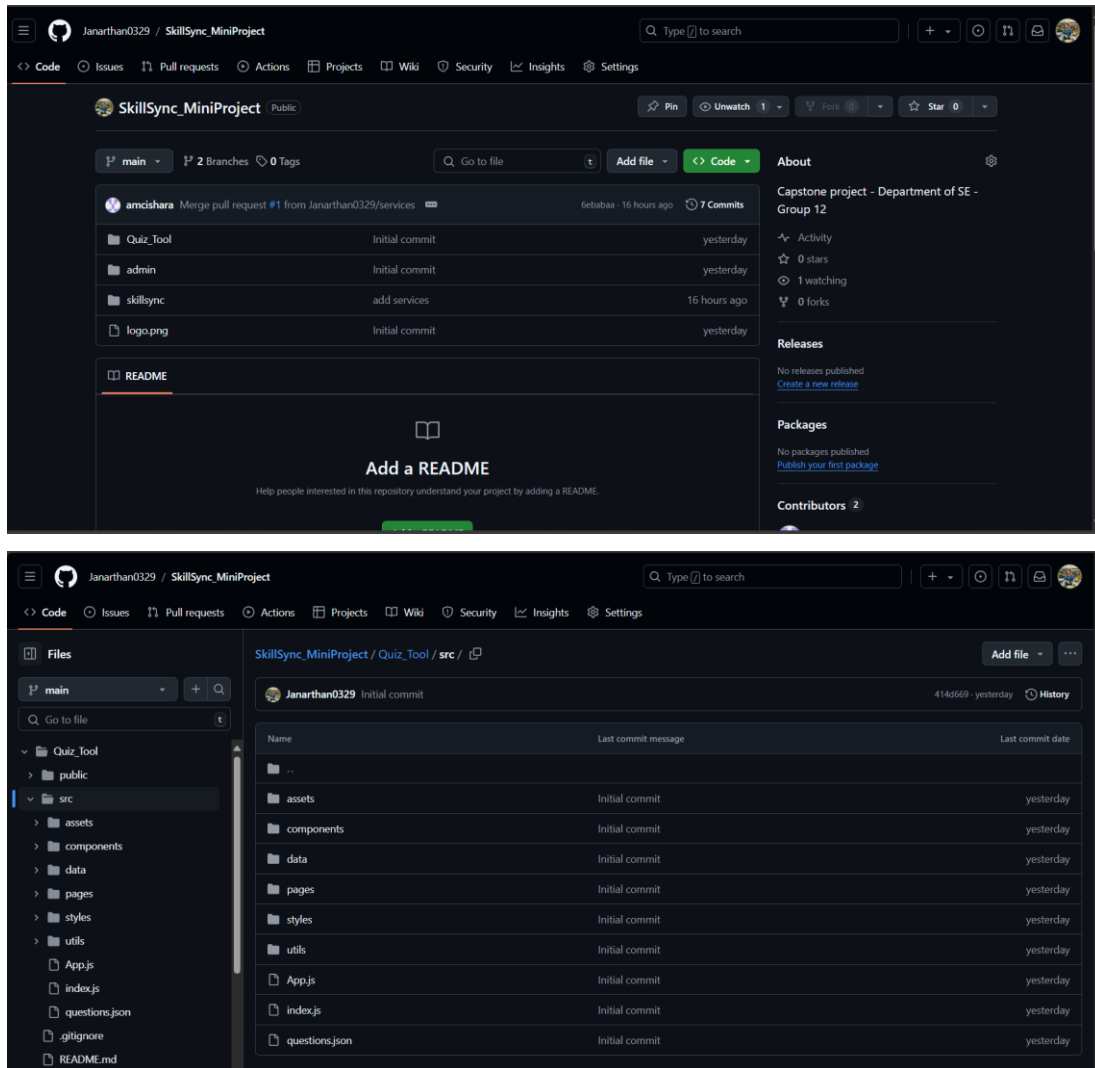


Figure 47 - GitHub Repository UI

8. Notification Services

We also linked our platform with notification services (such as email or SMS) to send alerts, reminders, and updates to our users.



Figure 48 - Gmail Logo

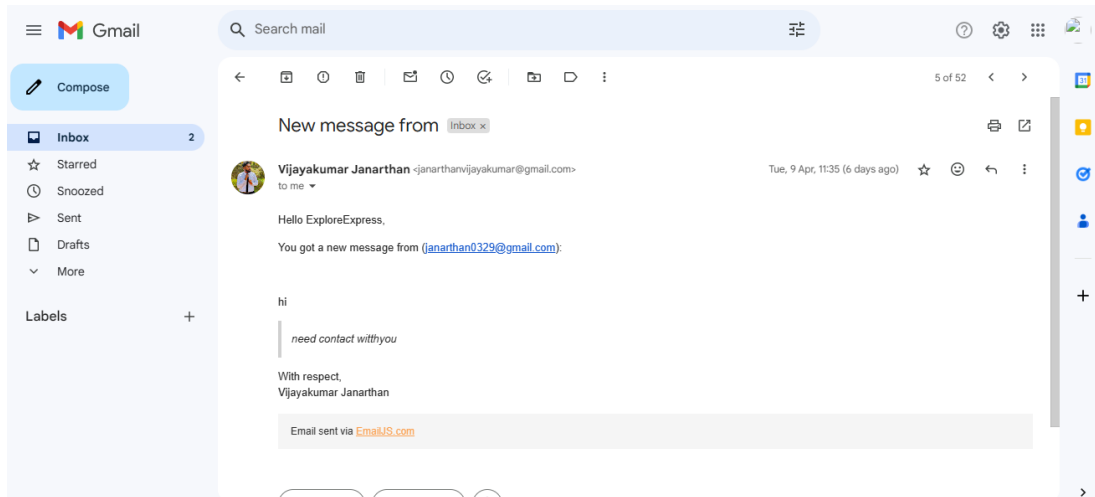


Figure 49 - Contact with Gmail



Figure 50 - SMS Logo

9. Testing and Quality Assurance Tools

We have utilized several testing frameworks for different types of testing, such as unit testing, integration testing, and user acceptance testing manually. We also used several tools for tracking bugs and managing the project, ensuring that issues are handled effectively.

- | | | |
|-------------------|---|---------------|
| ✓ Design Tool | - | Figma |
| ✓ Documentation | - | MS Word |
| ✓ Presentation | - | MS PowerPoint |
| ✓ Virtual Meeting | - | Zoom |



Figure 51 - Figma



Figure 52 - Word Processor



Figure 53 – PowerPoint



Figure 54 - Zoom

4.1.2 Hardware Requirements

1. Storage Capacity

SkillSync needs at least 2 GB of RAM to function seamlessly. This amount will give ample room for the platform with regard to temporary data storage, handling of users' requests, and processing several tasks that may range from course enrollment, uploading content, and various user interactions without the degradation in performance. Sufficient RAM guarantees that there will be effective multitasking in the event of people navigating the platform.

2. Database Management

SkillSync will require a fully-featured database server for storing user profiles, course enrolments, job postings, and offers of service. MongoDB is a very scalable, flexible NoSQL database that can store data securely yet accessibly. It allows fetching the data of users' learning progress and feedback efficiently, ensuring data integrity, security, and scalability when the platform grows.

3. Processor

For SkillSync to handle its computational resource demands, the application needs a dual-core processor or higher. A multi-core processor might execute many threads running in parallel with each other, and it enables the platform to execute user interactions smoothly, computational analysis of data, and other real-time functions concerning service listing and feedback mechanisms. This becomes highly vital in rendering responsive and seamless user experiences across the different features available on the platform.

4.2 Illustration of a Non-Standard or Innovative Way of Implementing an Algorithm and Data Structure

In the future versions, SkillSync will integrate state-of-the-art features like machine learning-driven personalized learning paths, AI-powered course suggestions, a chatbot to guide them in real-time, and a voice assistant for ease of use. This will really enhance the user experience with more intelligent, interactive, and accessible means for the users in search of education and career development resources.

For instance, machine learning algorithms can find skills analysis, learning patterns, and user interests to offer personalized learning paths, tailor job opportunities to meet user interests, and course recommendations within SkillSync. This level of personalization will ensure that users receive relevant content to add value to the overall experience on the platform.

Besides, the integration of a chatbot in SkillSync will offer round-the-clock support to the end users to help them sort out queries on course enrollments, career guidance, or troubleshooting. The chatbot will understand user questions through NLP and respond with immediate answers, contextually appropriate, to facilitate frictionless learning.

Also, the inclusion of a speech-recognizable assistant will facilitate users in interacting with the site through speech to perform desired clicks for easy and hands-free usage. This will definitely be convenient for users who want to enroll in courses, receive job posting updates, or interact with the system to request feedback regarding their learning and career advancement activities.

These enhancements set the epitome of our vision of continued innovation in SkillSync to meet their evolving needs, a comprehensive, intuitive, smart solution for education and career development in Sri Lanka.

4.3 Difficulties Involving Existing Software

In developing SkillSync, quite a few issues came up for which solutions had to be creatively sought and collectively developed.

1. Technical Issues

Building a complex platform like SkillSync came hand in hand with certain technical challenges: everything from coding errors, integration between components to performance. As in many first versions of applications, a great amount of time was given to debugging such problems.

2. Integration Complexities

Some of these services, like AI-powered recommendations and support for multiple languages, were not that easy to integrate. For them, this smooth communication between these systems without any glitch and the seamless performance on their platform was crucial.

3. Data Management

This called for special planning with regards to organizing and managing such an enormous quantity of user data, including but not limited to profiles, course enrollments, job postings, and service listings. We were envisioned to ensure the database was efficient and could be scaled up securely for storing all this information.

4. User Interface and Experience

This was quite an uphill task because we had to consider targeting an interface that was friendly and easy on the eyes for wide demographics, targeting students, tutors, and professionals alike. Ease of use targeted with elegance.

5. Testing and Debugging

Testing this project extensively was a very time- and work-consuming process, since we needed to get rid of the bugs and make it work accordingly so that everything went well with the users.

6. User Feedback

Implementing the feedback by early users was challenging because it required us to figure out in what sequence the issues had to be fixed and how further development of the features would meet user demands.

7. Security Concerns

With this was the guarantee of the security of a user's personal information and payment details by default. A strong security basis to make sure unauthorized access did not take place was really a challenging job to keep up with, yet so important.

8. Resource Constraints

Time and budget limited, hence compelling us to prioritize on features and make strategic decisions on what we could deliver in an initial launch.

9. Stakeholder Coordination

In a balance, we had to meet the expectations of team members and investors on one side and the users on the other side. Of course, this involved communication on all

levels. It helped us make sure that everyone was aligned with the project goals and progress of the work in due course.

In spite of these obstacles, we overcame those challenges as a team through collaboration, persistence, and problem-solving to ultimately create this powerful comprehensive platform that is SkillSync.

4.4 Lack of Appropriate Supporting Software

The same problems might appear when building **SkillSync** if we don't have proper software tools to make our development easier. Certain features could include AI-powered recommendations, real-time class updates, or multi language support that involves a particular type of software not available, or probably those will not cooperate well with our preselected MERN stack (MongoDB, Express.js, React, Node.js). If it's not possible to have an ideal set of tools to support these functions, some will cause a slowdown in development or make the implementation of functionalities that are planned difficult to implement smoothly.

Other problems can be that some of the tools we find lack complete documentation or community support. Without proper instructions or resources, the team may have a lot of problems understanding how to efficiently use the software. It could therefore take a lot of time or even delay things since a proper configuration of these tools was needed to take more time.

We may have to adapt to either building in-house custom solutions or modifying available tools to fit our needs at SkillSync to surmount these. It may also necessitate upskilling the team through training sessions on new technologies or finding other ways of solving problems. Although most of the tools to achieve this are not yet ideal, with some ingenuity and teamwork, we still can find ways to make **SkillSync** successful and develop a high-quality platform.

4.5 Over-Ambitious Project Aims

Big plans are also envisioned by **SkillSync**: to become the leading platform for education and career development of users-from course and service recommendations down to finding jobs or internships. It will be able to offer personalized recommendations based on user preference and also update users about job opportunities, course completion, and certification status. It will also include features for interactive capability, such as AI language support and service listings, that make it easy to interface with and get around the system. Equally important, SkillSync will be accessible to all users, including people with disabilities. The use of emergent technologies, such as machine learning and chatbots, will also be applied to the fullest capabilities. This might be complicated to build it all; hence, the main focus in the beginning will be on the most needed features to give it a good backbone.

This is what SkillSync is trying to do:

- Ease the user's access to courses, job postings, and services on one platform.
- Give recommendations personalized for each user's objectives and needs for learning and career development.
- Keep users updated about new job opportunities, gained certifications, and completed courses.
- Provide interesting features for users, such as AI-powered language support and interactive listings for services.
- Make it accessible to all users, including those with disabilities.
- Harnessing the use of new technologies, such as machine learning and chatbots, to make interaction with the government seamless.

5. Results and Evaluation

5.1 Final Outcomes of SkillSync

The **SkillSync** project aspires to bring revolutionary changes in education and career building within Sri Lanka with an easy-to-use learning and career-enhancing platform along with associated job opportunities. Here's what it will do:

1. Ease of Career Path and Learning Trajectories

SkillSync will facilitate an easy-to-use course search, job application, and networking with professionals. Its intuitive user interface will guide users through their career and learning trajectories without much hassle.

2. Personalized Learning and Career Recommendations

The system shall provide personalized suggestions to the users according to their profiles, be it course, tutor, or job posting. In this way, the users will always view the suggestions relevant to their career goals and learning interests.

3. Hassle-Free Job Hunting and Learning

SkillSync will bring all that in one place-so job applications, course enrollments, or service listings will be seamless. The users will not have to work with different platforms, and they can be assured that something will never fall through the crack.

4. Enhanced User Experience

Attractive features such as interactive AI-powered language support and real-time updates on course progress or job postings will enable users to stay informed and interested, hence enhancing the user experience of staying online.

5. Save Time

SkillSync will make it easier to find courses, services, and job opportunities in one go; hence, saving time. It will offer users all the necessary tools on one single platform where they can easily manage their profiles, applications, and learning with just a few clicks.

In a nutshell, **SkillSync** will make career and education management more feasible, accessible, tailored, and stress-free for each user's needs across Sri Lanka.

5.2 The Comparison of Experimental Results with Expected Values

Checking Experimental Results against Expected Values in **SkillSync** As we will be sharing our development stage platform with colleagues in order to receive feedback - we are not launching the platform to the market yet - here is how the process of comparing experimental results with expected values looks in this context:

1. Colleague Feedback

We get to hear from coworkers in interaction with **SkillSync** throughout its development process. Feedback will be compiled into observations, suggestions, and critiques regarding experiences on the site for tasks such as enrolling in courses, registering to be a tutor, and posting a job.

2. Expected Outcomes

In designing **SkillSync** to be what it is today, we have consciously surmised the reaction we will get from our colleagues: hypotheses such as feedback on user experience, ease of navigation, constructive input on the features implemented like personalized recommendations, and AI-based language support.

3. Comparison

We measure feedback from the peers against our expected outcomes as a means of understanding how **SkillSync** improves to satisfy its users. If the feedback closely resembles what we anticipated, then we know the platform is acting in the ways we intended it to. Any deviation between the feedback and the expected outcome gives insight into areas needing refinement for improvement.

4. Iterative Development

From this comparison, we do iterative development towards addressing feedback on refinement of features and fixes of the platform. This will ensure that **SkillSync** continually meets the dynamic expectations of its users for its usability and effectiveness before its release.

Through systematic comparison of colleague feedback with expected outcomes, **SkillSync** will go through an informed development cycle in which it will be user-ready and robust before hitting the market.

5.3 Description of the Interrelationship of the Experimental Results

Another perspective which arises from the results is the interrelationship between different aspects of the performance of **SkillSync**. Interrelationships of the experimental results for **SkillSync** are presented below showing how different aspects of platform performance are related and influence each other.

1. User Engagement and Satisfaction

Another important dimension for the experimental results would indeed be **user engagement** - that is, a measure of active use by the users of **SkillSync** features, such as course enrollment, job posting, and tutor registrations. High engagement is often hand-in-hand with **user satisfaction**, pointing at the value, intuitiveness, and enjoyment that the users gain from the platform.

2. Feature Effectiveness

The experimental results include the effectiveness of various features of **SkillSync**, such as AI-driven recommendations, job postings, rating systems, and feedback. All these factors can potentially affect user engagement and satisfaction with the overall usability of the platform. While effective features enhance usability, they also lead users to make more frequent use of the application.

3. Usability and User Experience

It is defined as the efficiency with which users can orient themselves and use **SkillSync**. The outcomes of usability testing in experiments show how far-reaching the ability of users to find it instinctive and accessible is. Generally, an excellent user

experience translates into higher levels of engagement and satisfaction, reflecting on the overall design of the platform.

4. Performance Metrics

Performance metrics include but are not limited to load time, responsiveness, and system reliability. Experimental results associated with these aspects of user experience and satisfaction-the slow loading or frequent errors frustrate the users and dent their experience. Good performance metrics lead to strong overall stability and reliability of the platform.

5. Feedback and Iterative Improvement

Experimental results also include user feedback, which becomes important for iterative improvements of SkillSync. Developers will be able to check qualitative feedback and performance quantitative data to find places that need the greatest improvement and prioritize updates and enhance user experience and functionality on the platform.

These experimental results interact with how **user engagement**, effectiveness of features, usability, performance, and feedback all interact to determine the success of the platform. By making this identifiable, the developer is in a better place to continuously update and optimize **SkillSync** for the needs and expectations of its users.

5.4 Achieved Accuracy

Testing the effectiveness of **SkillSync** involves confirming that it does meet the goals and serves the purpose for which it was designed. Here is how we have "sliced and diced" it for you:

Meeting Goals

We verify whether or not **SkillSync** serves its purpose by doing things like making education and career development easier by recommending personalized courses, job postings, and links to tutors.

What Users Say

We collect feedback from users who have used **SkillSync**. Positive feedback and a useful user experience mean the site is satisfying expectations and the needs of its users.

How It Performs

We review several key metrics including but not limited to, user engagement, how well features work, and the ease of use of the service in general. If **SkillSync** is performing well with these factors, it means that it is meeting the demands of its users and offering a good experience.

Getting Better

We will also determine whether the performance of **SkillSync** improves over time, by learning responses from user feedback and releasing platform updates. The frequent upgrades will indicate that the platform is evolving but still representative of actual user needs.

Comparison to Others

We can compare **SkillSync** against other similar platforms to understand its competitive performance. If **SkillSync** is performing as well or even better than other educational and career platforms, it is a good indication of success.

It also helps the analysis to assure that **SkillSync** is on the right track to meet its goals and improve with time.

5.5 Implications or Limitations

Analyzing **SkillSync** involves looking at both the bright and not-so-bright side of things. Challenges that the platform faces; here is a simplified breakdown:

1. Positive Implications

- Making Learning Easy

SkillSync will make it easier for students and professionals to find the right courses, tutors, and job opportunities to further their education and build their careers.

- Better Experience

Personalized recommendations and features to improve user satisfaction make the stay at the platform more enjoyable.

- Time-Saving

SkillSync makes access to education resources or employment opportunities faster, hence saving time.

2. Drawbacks

- Technical Issues

Like every other platform, **SkillSync** may be hit by technical hitches or glitches that might be detrimental to usability.

- Data Accuracy

While the data on **SkillSync** should be accurate, there are those moments when mistakes or outdated information could pose some problems.

- Accessibility Challenges

Inaccessibility to **SkillSync** may present difficulties, especially to users with disabilities.

- User Adoption

It is tough to have users try and continue using **SkillSync** when they are used to other platforms or methods.

By analyzing these strengths and weaknesses, a better understanding will be developed to improve **SkillSync** for future users.

6. Future Work

In the continuous development at SkillSync, the focus will be towards enhancing the user experience and providing an integrated solution for education and career development. Certain key features to be considered while working on the important aspects are enlisted as under.

1. Personalized Course Recommendations

We intend to embed various algorithms that would recommend courses to users matching their interest, skill, and career objectives. Using data analytics and machine learning methods, SkillSync will provide personalized recommendations for users based on their individual needs.

2. Embed Integrated Tutoring Options

We also plan to enhance the platform by adding tutoring services, thereby enabling users to connect with qualified tutors for personalized coaching in certain areas. This will ensure that the learners get the much-needed help that shall enable them to sail through their education.

3. Updated AI Chatbot with voice and image support

It will introduce instant guidance and support to users, revolutionizing the interaction by implementing an AI chatbot. Users can ask questions, request guidance, or ask for recommendations of courses that best suit their needs, further enriching the experience.

4. Community Building via Discussion Forums

We shall introduce discussion forums to facilitate interactions among the users. This community-driven approach has several benefits: knowledge sharing, helping each other, and collaboration-all of which help the users learn from one another.

5. Optimization Tools for Performance

These would be further enhanced in the development of tools guiding a user in tracking their progress, goal setting, and personalized feedback, tools that could enable users to manage and be responsible for their learning processes.

6. Updated Feedback and Review Mechanisms

Robust review and feedback mechanisms will be provided to enable users to share their experiences regarding courses and tutoring services. Valuable feedback will provide a basis for continuous improvement and inform feature prioritization.

7. Gamification Elements

The inclusion of gamification elements will make learning rather engaging and pleasant. Badges, leaderboards, and rewards after course completion will motivate users and increase their interest in learning.

8. Mobile Accessibility

We also want to convert SkillSync into a mobile-friendly device so that users can switch to this mode anytime and anywhere to make learning easier on the go.

9. Consultation Services

Customized career development counseling and support for better career choice decisions will be offered to clients. This service will offer users consultations with industry experts for individual advice.

10. Internship Guidance

We want to provide personalized support for internship job searching and performance. This will involve resources and tools that will guide the user in how to prepare for and perform well during the internship.

11. Integration of Chat System

Enable real-time communication between users and tutors, and such immediate communication will provide a way for smooth interaction and support; hence, it will be easier for learners to seek help at any time.

12. Social Media Integration

This will enable users to share achievements, courses taken, and experiences on social media platforms, create communities, and scale our user network.

In summary, the SkillSync roadmap contains a diverse set of features and enhancements for a better learning experience, community building, and success of our users in achieving their educational and career goals with more confidence and ease.

7. Conclusions

The key successes and lessons of our development process require highlighting as we conclude our project on SkillSync. SkillSync is not just an educational platform; it is going to revolutionize the world of education and career development in Sri Lanka with the wholesome package offered to users in skimming their learning and career journeys.

Implication of the Results

SkillSync answers the felt need for an integrated platform that clusters educational resources, career guidance, and personalized support. It makes the going far easier for any learner or working professional through SkillSync, which offers course recommendations, opens up options for tutoring and consultation services. Emphasis on user-centric solutions has made this platform very significant in terms of educational advance and career success.

Validity of the Results

The feedback during our testing phases reinforces the effectiveness of SkillSync. Each user was satisfied with features such as personalized course suggestions and the integrated chat system, providing the ability to communicate in real time with tutors. This positive reception will in turn further validate our approach, showing we effectively meet our target audiences' needs.

Gaps and Limitations of the Findings

Even though much has been done, some limitations should be considered. The guidance of students on internships and notifications are not yet fully developed with the enabling of AI technologies. These lacunas show where future developments and fine-tuning need to be done, pointing to ongoing development that is needed for improved user engagement in support.

Moving forward, it is these shortcomings we must commit to resolving. We will update the lessons in line with users' feedback and continuously extend the features, while improving the user experiences with innovative technologies and personalized support.

All in all, SkillSync has had an exceptional journey of rebuilding education and career development in Sri Lanka. The solid platform provided for personalized learning and career guidance empowers us with assurances to our users of confident attainment of their goals. Though challenges persist, we remain very optimistic about the future and the role that SkillSync will continue to play toward shaping the face of education and career growth.

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Ready to learn how to make a website secure?

Keep reading, as we're covering the nine-step process of creating a secure website for your business. If you need a secure website for your business now, though, contact us online or call us at 888-256-9448 to learn more about our web design services!

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9. Appendices

9.1 GANTT Chart

The Gantt chart for **SkillSync** offers a visual representation of the project's timeline and task dependencies, highlighting key milestones, tasks, and deadlines. This organized layout enables project managers to effectively plan, schedule, and track progress throughout the development process.

By clearly outlining all project activities, the Gantt chart ensures that tasks are completed on time and that resources are allocated efficiently. It provides stakeholders with a comprehensive overview of the project's timeline, allowing them to monitor progress, identify potential delays, and make informed decisions to keep **SkillSync** on track.

Overall, the Gantt chart serves as a crucial tool for coordinating efforts, facilitating communication among team members, and ensuring that the project meets its objectives in a timely manner.

Table 03 - GANTT Charts

Activity	Time Duration (In Weeks)														
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Research															
Create Project proposal Document															
Requirements Gathering															
System Design															
Implementation															
Testing															
Deployment and Maintenance															
Final Project Report															

9.2 Demonstration Video

Figure 55 - Demonstration Video