An Undergraduate Internship/Project on Topic

By

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Summer, 2021

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Lecuturer

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Dissertation submitted in partial fulfillment for the degree of Bachelor of Science in Computer Science

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Attestation

This is to attest that the report titled "Shikhao Core Application" was completed by Amit Aditaya, ID-1722162, submitted in partial fulfillment of the requirement for the Degree of Computer Science from Independent University, Bangladesh (IUB). The project was completed under the guidance of Md Asif Bin Khaled and Mr. Murshed Al-Amin Tonar (External Supervisor). I also certify that that the work that I have done original and all the sources of information has been duly acknowledged.

Signature	Date
Amit Aditaya	
Name	

Acknowledgement

I would like to start by thanking The Almighty Allah for giving me the strength, patience and the capability to endure hard work and pressure. I would also like to thank my late father and my mother for supporting me every single day and for giving be the opportunity to be here. I would also like to thank Shikhao and it's team for giving me the opportunity to work for them.

I would also like to express my sincerest gratitude and appreciation to my internal supervisor Md. Asif Bin Khaled, Lecturer, Department of Computer Science and Engineering, Independent University, Bangladesh (IUB), who gave me all support by taking his time out to guide and keep motivating me to complete the project patiently. I express my deep gratitude to external supervisor and my mentor Mr. Murshed Al-Amin Tonar, for appointing me as an Intern and including me to their team and company. Without his extreme energetic support and guidance, I could not finish the project successfully. Last but not the least, I would like to thank my parents and other family members for their eternal support that they have always given to me. Finally, I would like to thank Independent University Bangladesh, and all the respected faculties and staffs who were a vital part of my bachelor's program in CSE. My respect and heartful gratitude go to my faculties and mentors who shared their knowledge with me to teach and prepare me to achieve success in my future.

Amit Aditaya
August 2021
Dhaka, Bangladesh

Letter of Transmittal

20 January, 2021
Md. Asif Bin Khaled
School of Computer Science and Engineering
Independent University Bangladesh

Subject: Submission of Internship Report.

Dear Sir,

This letter is written to kindly inform you that I, Amit Aditaya, would like to submit my report of Internship for the completion of my Bachelor of Computer Science and Engineering degree. The report is based on my experience that I gathered from July 01, 2021 to August 31, 2021, at Shikhao, which is an Edu-Tech Company located in Dhaka. I was assigned to work as a Mobile Application Developer for the front-end part of the application that they will be launching soon. I tried my best to communicate and gain knowledge about the work in the mobile application development industry, a sector I am passionate about, and have a firsthand taste of the corporate world.
I sincerely hope that you find this report to be informative and that it meets all your expectations. I tried by very bast to avoid inadequacies and keep all its contents up to standard. Finally, I would like to thank you for the wonderful opportunity given to me to submit this report.

Sincerely,
Amit Aditaya
ID – 1722162

Evaluation Committee

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Signature

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Name

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Supervisor

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Internal Examiner

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External Examiner

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Convener

Abstract

Bangladesh is an evolving digital nation and the number of people using the internet and new technologies are higher than ever. Internet has reached every corner of the country and the number of smartphone user are increasing every day. People are now more aware of the technologies around them and has started to embrace both old and new technologies. As a result, business organizations can easily utilize the internet and the platforms in it for their own benefits. The internet along with all its platforms has changed the way that tutors are hired by students. Getting academic help for home, meeting all student criteria, has never been easier. Shikhao, being a start-up Edu-tech company, has used this opportunity to create awareness for themselves and managed to get a hold of a number of customers, requesting their services on a regular basis. Shikhao hopes to leave a real impact on the education industry and the society through innovation, originality, and integrity. They have used their Facebook page and their website to conduct most of their business till now and have recently decided to go for the development of a mobile application that will not only ease their services but will change the way tuitions are done, especially in universities. The following report describes my internship work and my contributions towards the development of this mobile application. The application was made from scratch by me and the in-house developers and was initiated after I joined. The report contains 8 major sections, explaining the project and the process of the development. The first part, Introduction, briefly explain the project as a whole and its scopes. The second and third chapter contains the literature review and the project management and financing respectively. Here, I have made the connection of the project to my undergraduate work, I have also shown the breakdown of the time and resources in the respective sections. The next section, Methodology, shows the methods and the strategy that we used to create the project. The fifth chapter titled body of the project, in fact is the most important part of the report. Here the system analysis is discussed with thorough discussion on different techniques of analysis and diagrams. The next chapter, Result and analysis, covers the result we obtained after the development and analyzed what we achieved. Chapter seven is the discussion on the sustainability of the project, social and environmental effect and the ethical aspects. Finally, in the last chapter, along with the conclusion of the report, I discussed the scope of future works.

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Chapter 1

Introduction

1.1 Overview/Background of the Work

Bangladesh, as a nation, is living in a digital age, and we are embracing new technology and systems every day. Over the last decade, we have become increasingly reliant on the internet in our daily lives. Taking advantage of this opportunity, every business is attempting to establish a presence on the internet and make their services more accessible online. Shikhao, being an Edu-tech company has done exactly the same and is looking to broaden its horizons.

The business involving tuitions is an old fashioned one. Before the era of the internet, students would go to a teacher near them, usually after school, in order to get some extra help with their academics. In exchange for the teacher's services, the parents of the students would reimburse the teacher with a small fee on a monthly basis. When the internet became fairly accessible, the process of finding a teacher for a student, whist meeting certain criteria because much easier. There were (and still are) agencies that would play the role of a middleman between the teacher and the student and connect the two parties in exchange for a small amount of fee. Shikhao is involved in the same business but with a very different business model. Shikhao hopes to bring the tuition culture to universities. Currently, the only way to get outside help, that is, without the help of your faculty, is from a friend or a course-mate. Even, then not everyone is always willing to or is ready to help. Shikhao aims to fix this issue by playing a similar role as an agency, in bridging the gap between the teachers and students within a university. Shikhao strongly believes that not everyone learns with the same pace and a university going adult may not always have the time to attend or keep up with a class. It is very normal for a student to seek outside help. The teachers at Shikhao are students themselves who become eligible to teach a specific course when they pass that course themselves with a good grade.

1.2 Objectives

The main objective of the project is to make process of hiring a tutor for university courses through Shikhao easier and to be able to provide the company services on a broader platform. The solution would be to, to be able to hire a tutor, as simply as finding a ride in uber, directly connecting the students and teacher in the process. The current hiring process through Facebook, with exchanging texts, is considered rather boring old fashioned. As a result, much emphasis has been given to the user experience (UX) of the project. As the team in Shikhao says, the experience of hiring a tutor should be unlike any other, making the process of learning fun.

This project will also create jobs for teachers (who are also students) and will become a medium for students for making quick money. Given, enough sessions and time, a teacher can earn up to five digits per month through the app. Give the current pandemic situation, the demand for tutors have increased significantly as many students found it hard to keep up with the pace and materials of an online setting, hence, needing assistance later. Thus, this was the perfect time for Shikhao to launch an app. The mobile application will be able to support all the current features and services that Shikhao provides along with additional, features that will be introduced along the way.

1.3 Scopes

i. Landing Page – The page the user will be directed to when she/he clicks on any links from online ads or when the user is logged out and clicks on the app from the phone.
ii. Login Page – This page is displayed if the user clicks on the app from the phone but is not logged in.
iii. Registration Page – This page is displayed if the user clicks on the app from the phone but has not registered yet.
iv. Posts Page – This is the home page when a teacher logs in, it shows all the available tuitions that the students posted.
v. Post Details Page – Displays all the details of a post when a specific post is clicked on.
vi. Edit Profile Page – This page is displayed when a user wants to edit his/her profile and clicks on the edit profile button. This page has differences for teachers and students.
vii. Help page – This section will be shown once the help button is clicked when a student needs help regarding any issue with the application.
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Chapter 2

Literature Review

2.1 Relationship with Undergraduate Studies

The work that I have been doing at my internship is related to most of my CSE courses that I took during my time at IUB. But the courses that stand out, the courses that taught me the most to translate to my internship work are CSE213, Object Oriented Programming: My entire project is based on the programming language 'Dart' which is an object oriented, class-based language with C style syntax [1]. The fundamentals that I learned during that course helped to throughout the project. CSE307, System Analysis and Design: The lesson learned in CSE307 was crucial to my everyday work as the course taught me about Software Development Life Cycle (SDLC). In my project, we used the Agile method for SDLC. The course also taught me to make a report quite similar to this one which is also a huge bonus. CSE303, Database Management: This course taught me all that I needed to know about the back-end part of a project. I learned about data come and goes to the back end which is something that I had to keep in my mind during the design and implementation part of my project.

2.2 Related works

From the beginning of the internet era, the tuition business has been mostly conducted on Facebook as it contains the most users that log in on a daily basis. Now that everyone has a smartphone and that everyone has slowly embraced the mobile technology and culture, all kinds of businesses, along with tuition businesses are looking to make custom mobile applications that cater to their customer's needs with their services. A few known, local tuition business to have done this are listed below. It is important to know that even if they are now offering services on a newer platform, Google Play Store and Apple Appstore, they have still not shutdown their previous platform as they can benefit from operating on multiple platforms.

i. CareTutors: Caretutors is a well-established company in the tuition business and one of the firsts with an application on the Google Play Store. The application meets all their functionalities, however most of their business take place on their Facebook page.

ii. TuitionApp: TuitionApp is also a company based in the tuition business with their functionality and business model being exactly the same as CareTutors.

Although Shikhao is also in the tuition business, the project that I have been working on, along with Shikhao's business model can be considered brand new as a tuition service for universities have not been implemented before, these companies can be considered the closest competitors of Shikhao and has the most relatable work with Shikhao as Shikhao also started out on Facebook and is now moving towards the mobile application platform.

Chapter 3

Project Management & Financing

3.1 Work Breakdown Structure

The work breakdown structure (WBS) is a vehicle for breaking an engineering project down into subproject, tasks, subtasks, work packages, and so on. It is an important planning tool which links objectives with resources and activities in a logical framework [1].The figure below illustrates our WBS with a top-down approach and it has been created so that everyone has a better understanding of the scope of the project and the objectives that needs to be set. The phases in our level 1 are given below.

i. Initiation: This phase basically completes the setting up process of the project, includes assigning individual tasks, making sure everyone knows what the goals are and what is expected from everyone thought all the phases.
ii. Design: The design layout is produced here using various techniques and tools. Everything is edited and finalized through the guidance and approval of the senior members respectively.
iii. Implementation: Here, the designs are brought to life using different tools and techniques. Every member of the team is assigned different implementation tasks and optimization also takes place during this phase.
iv. Testing: The testers of the company take the project to many kinds of testing phases and make sure that whatever has been implemented is bug free, if a bug is found, it is sent to be fixed.
v. Deployment: Taking the application live on Google Play Store and the Appstore though various releases.

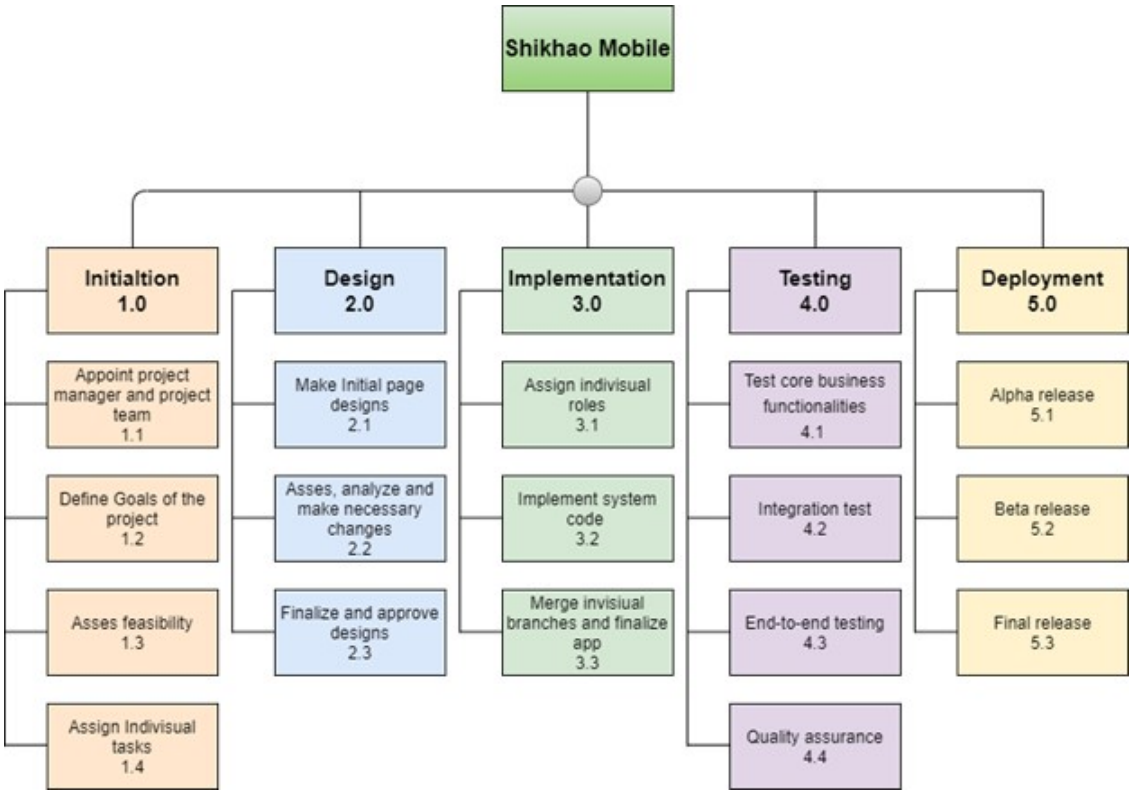


Figure 3.1: Work Breakdown Structure

3.2 Process/Activity wise Time Distribution

The process wise time distribution, according to our WBS, will show us the duration that each major process is going to take, it will also help us to construct the critical path of our project. The total estimated time for the project is 100 days excluding holidays and breaks and the table below shows the duration assigned for each process, the critical path table. Each process is given a code (e.g., A, B, D1, D2 etc.) so that we can identify each task in our future diagrams easily.

	Activity	Predecessor	Duration (days)
A	Initialtion	x	5
B	Design	Initiation	9
C	Implementation	Design	28
D1	Unit Testing	Implementation	5
D2	End-to_end testing	Implementation	5
D3	Quality Assurance	Unit testing, End-to-end testing	5
E1	Alpha reslease	QA	14
E2	Beta release	Alpha release	14
E3	Final release	Beta release	14

Table 3.1: Critical Path Table

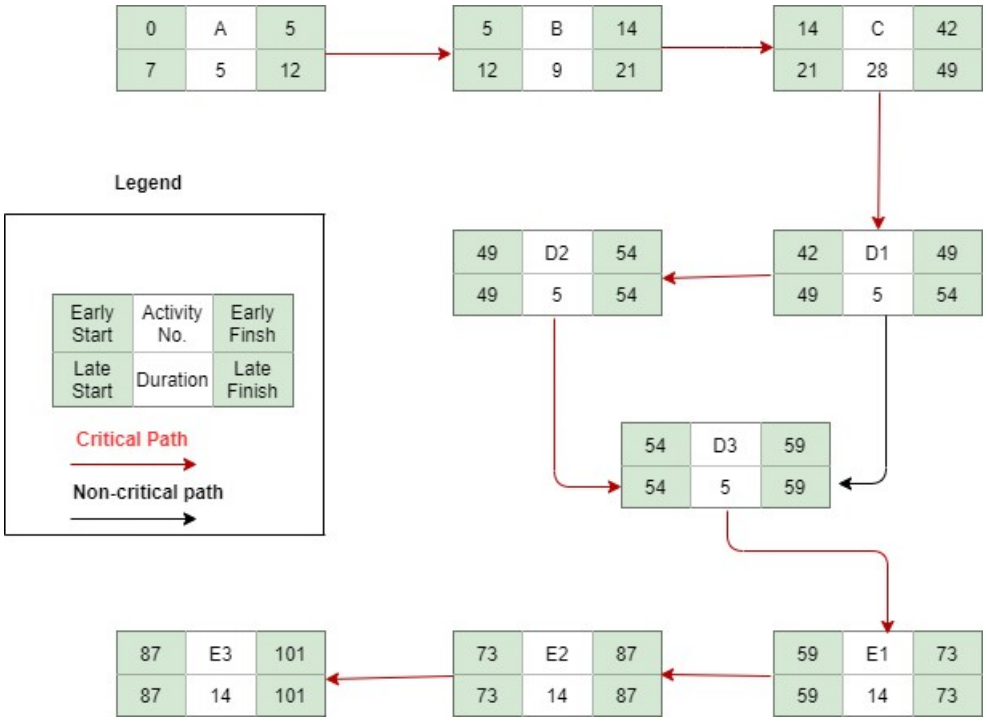


Figure 3.2: Critical Path

The figure above shows the approximate activity distribution of each major process along with the critical path shown in the color red. As shown, the project will take almost three and a half months to finish.

3.3 Gantt Chart

A Gantt chart is a graphical representation of a project schedule that is widely utilized. It's a form of bar chart that displays the start and end dates of project elements including resources, planning, and dependencies. Shikhao's project also has a Gantt chart which helped us keep ourselves on schedule and is provided below.

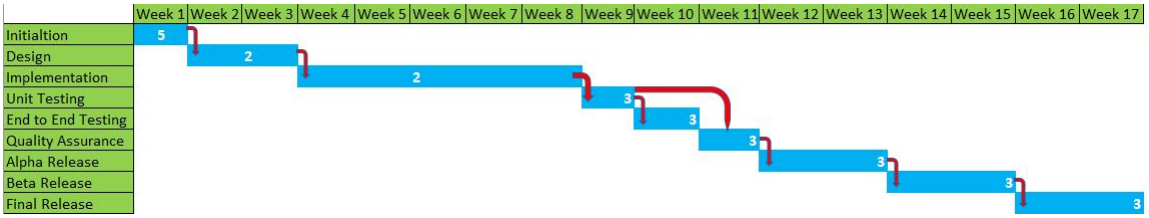


Figure 3.3: Gantt Chart

3.4 Process/Activity wise Resource Allocation

Process wise resource allocation shows the resources that will be required for each process of the project. In our case, the only entity identifiable as a resource is the labor and the resource allocation histogram shows that the company will require a maximum of 5 labor (developer + stakeholders) during the project, however in most of the processes we will require just 3 personnel (me and two other developers).

Tasks	Days	Labour
Initiation	1-5	5
Design	6-14	2
Implementation	15-42	2
Unit Testing	43-48	3
End-to-End testi	49-54	3
Quality Assuranc	55-60	3
Alpha testing	61-74	3
Beta Testing	75-99	3
Final Release	101-114	3

Table 3.2: Resource Allocation Table

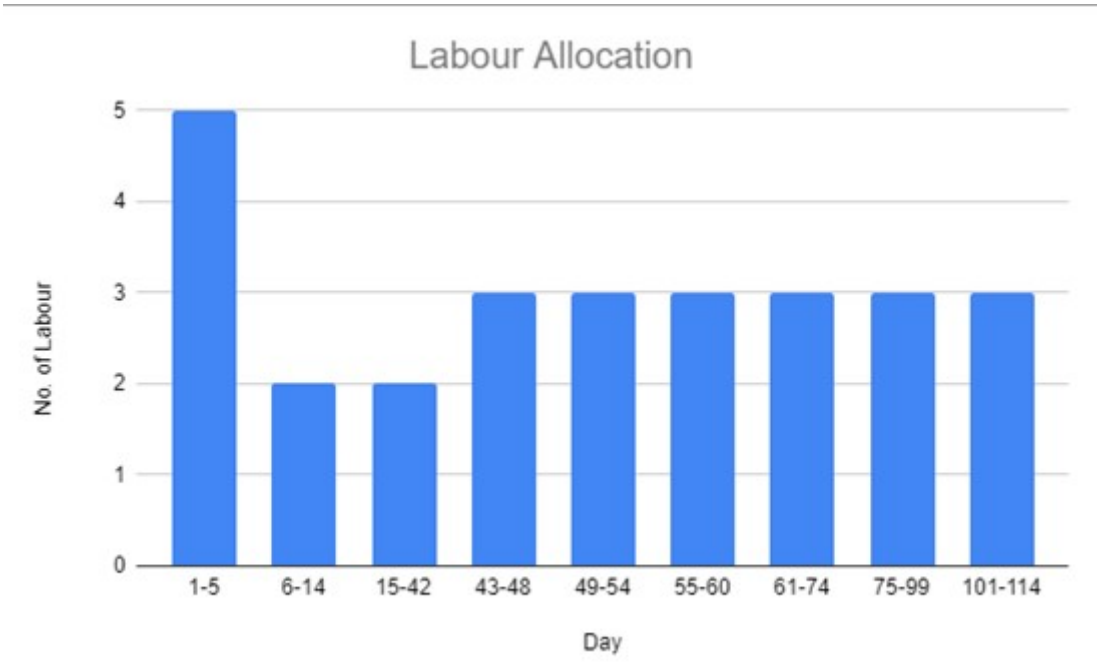


Figure 3.4: Resource Allocation Histogram

3.5 Estimated Costing

The costing of an application development is dependent of several factors. Considering that Shikhao is a startup company, its operation cost is fairly low. The costing of Shikhao's project can be broken down into 5 major sectors. The table below shows how much money is spent in each sector monthly.

Sector	Costing per month (BDT)
Salary of people involved in development	35,000
Web Domain	720
Database	450
Deployment	660
Miscellaneous	10000
TOTAL	47,830

Table 3.3: Estimated Costing

Chapter 4

Methodology

Software development life cycle or SDLC for short is a methodology for designing, building, and maintaining information and industrial systems [2]. SDLC defines the development, enhancement, maintenance and replacement plan in details along with other functionalities. There are many types of SDLCs. Some of the most popular SDLC model are: -

- Agile
- Waterfall
- Lean
- Spiral
- Iterative

Each SDLC model is different from one another and is chosen according to the project specification. However, they all serve the same function of organizing a project and assisting the project team in operating more successfully and efficiently.

4.1 Our Approach

The Agile model, according to experts, is the best SDLC technique for startups. The agile method emphasizes the development of working software rather than the documentation of the development process. A software that works is worth more than documentation for a software that doesn't. As conditions change throughout the development process, the technique allows you to adapt to the development process plan is always going to be the best and with Agile you can change the project's goal without incurring losses, as the company is a startup . Therefore, naturally, the project managers went for the Agile model for our project as well. The figure below briefly illustrates an Agile model at work.[3]

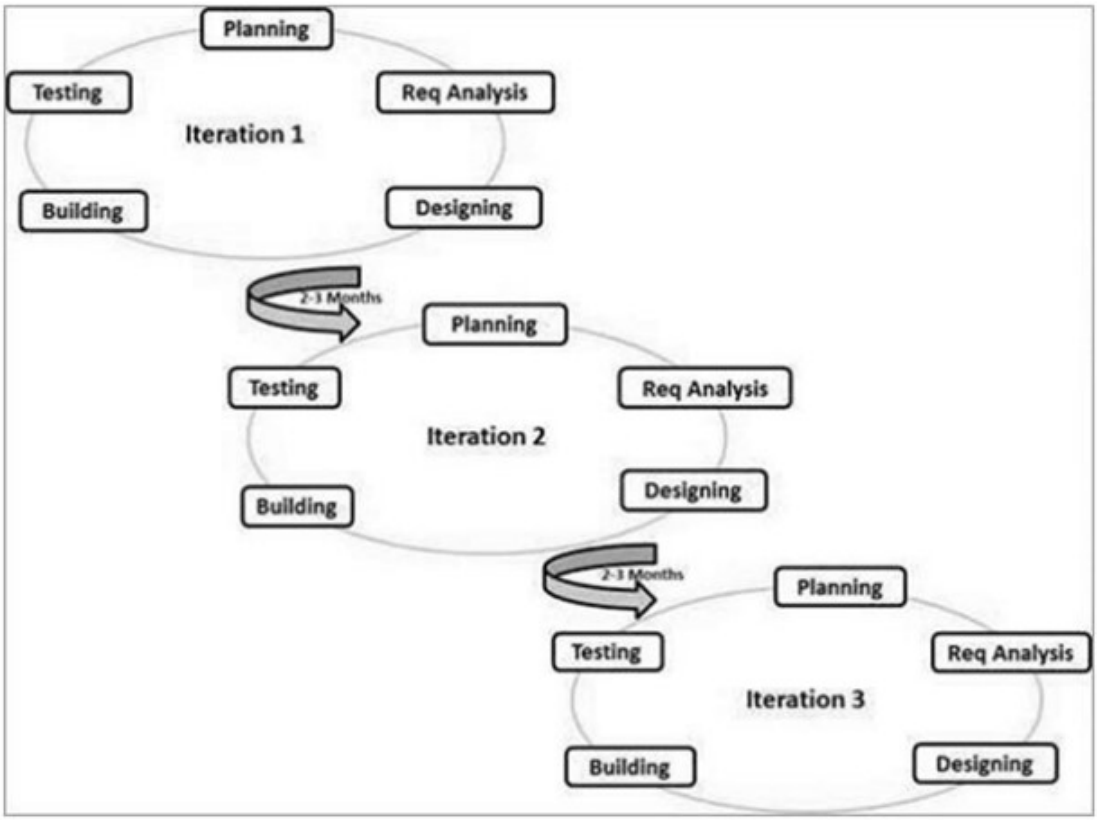


Figure 4.1: Agile Method

With each iteration, the team had to provide with a certain deliverable and every requirement needed to be fulfilled before moving on to the next iteration. For Shikhao, the iterations were the 1st tier/level of the WBS. For example: -

1st Iteration: -
- Initiation

2nd Iteration: -
- Design

3 rd Iteration: -
- Implementation

Using the Agile model not only helped us improve productivity and efficiency, but it also ensured that we were developing exactly what the project manager had asked for as we were win constant contact with him, getting feedback and adjusting to change requests accordingly.

Chapter 5

Body of the Project

5.1 Work Description

During the initial stages of the project, I was asked to create mockups of all the pages that will be designed for the mobile application using Figma. Then I had to get the designs approved by the senior members of the team. After some changes the designs were finalized, and I was asked to implement the pages using Android Studio and the Flutter framework. I was constantly reminded that my code had to follow convention, must be efficient and optimized for performance. I had to do a lot of research in order to achieve this. My code was run regularly and was checked and monitored by one of the senior developers. The primary goal of my work and my team was to create a jag free application with no compromise in the user experience. Many pages were initially rejected due poor UX design but eventually I developed a pattern in the design that could be persistently used and met industry standards. I also used multiple flutter libraries to help me develop my project better and faster.

5.2 System Analysis

Systems analysis is "the process of studying a procedure or business to identify its goal and purposes and create systems and procedures that will efficiently achieve them". Another view sees system analysis as a problem-solving technique that breaks down a system into its component pieces, and how well those parts work and interact to accomplish their purpose [4].

5.2.1 Six Element Analysis

	System Roles					
Process	Human	Non-computing hardware	Computing hardware	Software	Database	Communication & Network
Login/ Sign-Up	User, teacher and student	N/A	PC/Laptop, mobile phone	Google chrome, Safari, Google Play Store, app store, Shikhao app	PostqresSQL	TCP
Create a post	User, student	N/A	PC/Laptop, mobile phone	Google chrome, Safari, Google Play Store, app store, Shikhao app	PostqresSQL	TCP
Accept a post	User, teacher	N/A	PC/Laptop, mobile phone	Google chrome, Safari, Google Play Store, app store, Shikhao app	PostqresSQL	TCP
Delete a post	User, student	N/A	PC/Laptop, mobile phone	Google chrome, Safari, Google Play Store, app store, Shikhao app	PostqresSQL	TCP
View post details	User, teacher	N/A	PC/Laptop, mobile phone	Google chrome, Safari, Google Play Store, app store, Shikhao app store,	PostqresSQL	TCP
View post lists	User, teacher	N/A	PC/Laptop, mobile phone	Google chrome, Safari, Google Play Store, app store, Shikhao app	PostqresSQL	TCP

Table 5.1: Six Element Analysis

5.2.2 Feasibility Analysis

A feasibility study examines how well a project can be completed while taking into account a variety of aspects such as economic, technological, legal, and scheduling considerations. Before investing a significant amount of time and money into a project, project managers conduct feasibility studies to analyze the project's potential positive and negative effects. A feasibility study determines whether an idea, a project, or even a new business is viable.A feasibility study's objective is to focus on potential problems that could arise if a project is pursued, and to assess whether the project should be pursued once all major variables have been examined. Feasibility studies also enable a company to consider where and how it will operate, as well as potential barriers, competitors, and the money required to get the company off the ground.If the proposed system is approved by management, the following step is to assess the system's practicality. In short, following decisions are taken in different feasibility study:

1. Technical Feasibility: Shikhao is backed up by a few very skilled developers who have experience in working in both the international and the local market. Any change in demand or technology can be easily adopted to by the team at hand and therefore the project is technically feasible.
2. Economic Feasibility: The economic feasibility is always a challenge for startups but lucking the team has sufficient funding for the development phase of the project. After the project is deployed, Shikhao is projected to make sufficient money to sustain and even make profits.
3. Operational feasibility: At the moment, there are no companies that allows a student to hire tutors by the hour and judging from market research, there is a very big demand for it from university students, especially those seeking help with assignments. Thus, the project is operationally feasible.
4. Schedule Feasibility: Schedule feasibility is about the time taken for designing and implementation of the solution. It makes an estimation about the project will deliver within an acceptable time period. This project has to be delivered to the company within the deadline. So, according to estimation this project has scheduled feasibility.

5.2.3 Problem Solution Analysis

Shikhao is still at its infancy in-terms of development. The last thing Shikhao needs is a jaggy application, like the Shohoz mobile app, when it finished. Being a UI/UX developer, I am trying my very best to ensure that the designs meet industry standards, the code is efficient and optimized for performance but also not to compromise on the user experience and feel of the application. I had to do a lot of research to find out how to achieve this but at the end of the day, all help was available online and I could move on without much delay.

5.2.4 Effect and Constraints Analysis

The application is meant to serve its users with an uber like experience, where you get a tutor on demand. However, since the company's customer and teacher base are still very small, there will be an issue of not being able to meet the demand when the application first rolls out into the market. The lack of teachers when they are being demanded will lead to poor user experience and feedback, leaving a negative effect whereas lack of students will drive the company out of business as a whole. However, the company has plans and more importantly funding to tackle those problems. Marketing, branding, and mane are strategies are being developed to ensure that the application becomes a hit upon launching.

5.3 System Design

Systems design is the process of defining the architecture, product design, modules, interfaces, and data for a system to satisfy specified requirements [8]. Below is a list of figures, roughly showing the system design of Shikhao.

5.3.1 Rich Picture

A Rich Picture is a method of exploring, acknowledging, and defining a situation, and then expressing it using diagrams to form a rough mental model. A rich picture helps to open discussion and come to a broad, shared understanding of a situation. The figure below shows the rich picture of our project at Shikhao.

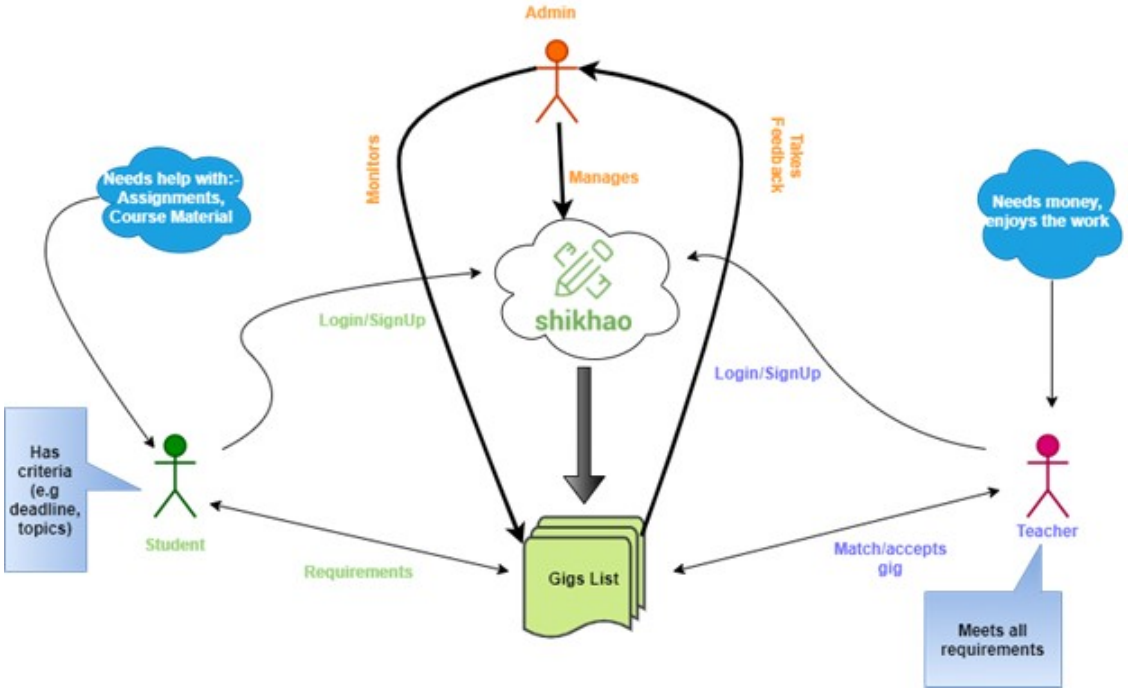


Figure 5.1: Rich Picture

5.3.2 UML Diagrams

In the realm of software engineering, the Unified Modeling Language (UML) is a general-purpose, developmental modeling language that is designed to provide a common way to depict a system's architecture [9].

Use Case Diagram

A use case diagram is a visual representation of the details of a system and its users. It is typically depicted as a graphic representation of interactions between various parts in a system. Use case diagrams describe the events that occur in a system and how they flow, but they do not define how those events are implemented [10]. The figure below shows the Use case of diagram of the system that we are developing. There are 3 actors to the system and their roles are highlighted with individual colors on the diagram.

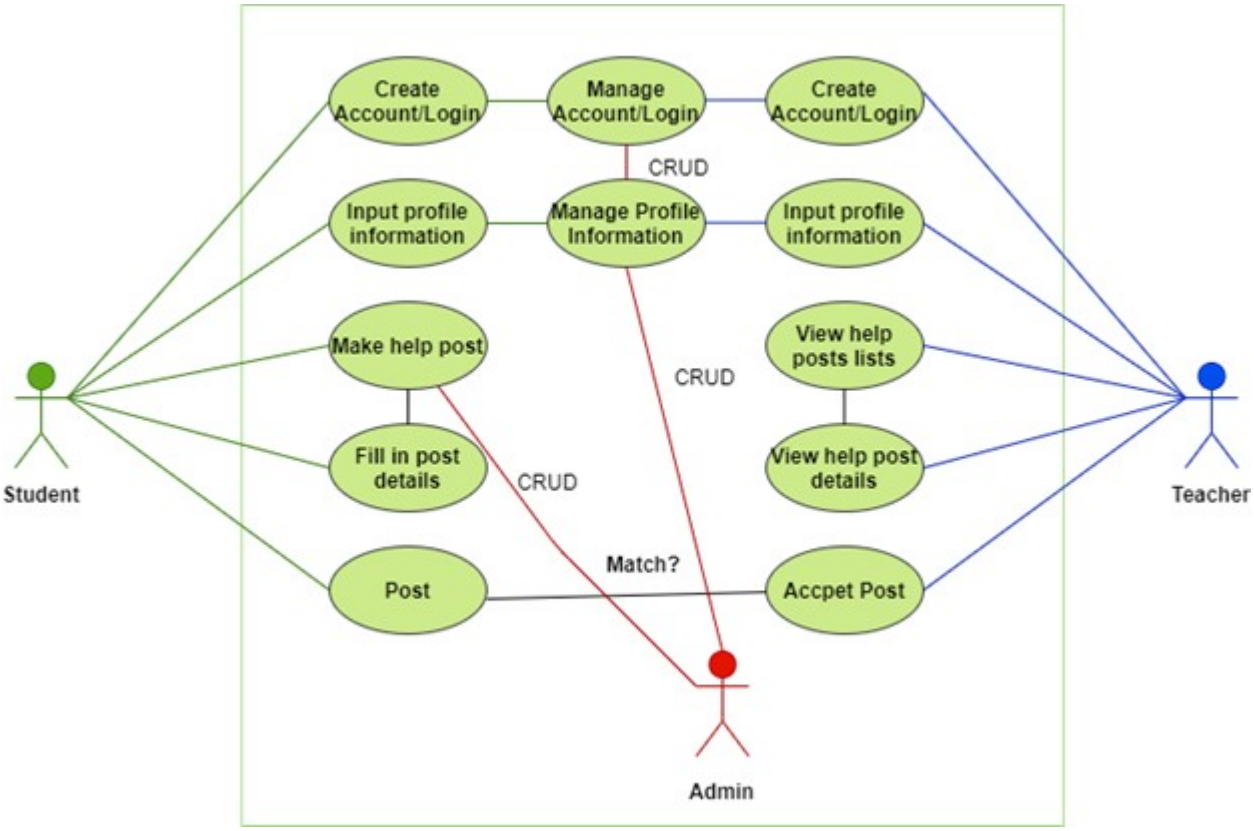


Figure 5.2: Use Case Diagram

Data Model Diagram

An Entity Relationship Diagram (ERD) is a flowchart that depicts how "entities" in a system interact with one another, such as people, objects, or concepts. In the disciplines of software engineering, business information systems, education, and research, ER Diagrams are most commonly used to build or troubleshoot relational databases[5].

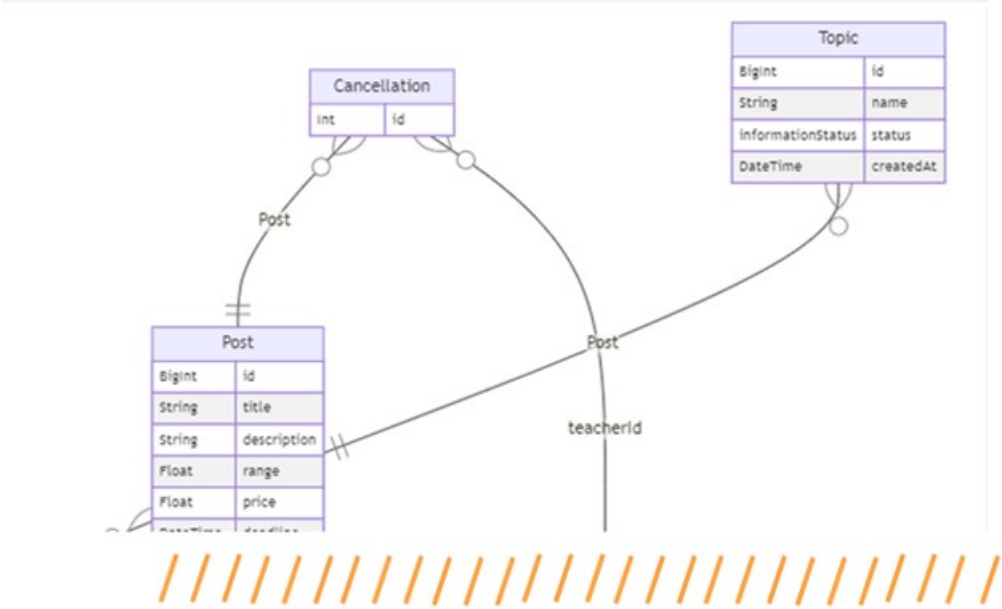


Figure 5.3: Entity Relationship Diagram

5.3.3 Functional and Non-Functional Requirements

Functional Requirements

Function: Must be compatible with browser, all android and IOS supported devices		
Input: N/A	Process: System must be developed in a common development environment (Flutter)	Output: System must be accessible from all sorts of devices
Precondition: User must have a computer or mobile phone with internet access		
Postcondition: Everyone can use the system		

Table 5.2: Functional Requirement 1

Function: Student must be able to create a help post		
Input: Post details (hours, course name etc.)	Process: Fill up the details in the create post page	Output: Post created
Precondition: User must have a computer or mobile phone with internet access		
Postcondition: Post can be seen by all the teachers in the system		

Table 5.3: Functional Requirement 2

Function: Teacher must be able to view post list		
Input: Click in post list	Process: Click on post list page on the application	Output: All the post made by students are shown in a list
Precondition: Login credentials, smartphone or pc with internet access		
Postcondition: Teacher able to see all available posts		

Table 5.4: Functional Requirement 3

Function: Teacher must be able to view post details		
Input: Click on post details	Process: Click on the arrow in post list to see all details	Output: All the details posted by the student is shown
Precondition: Login credentials, smartphone, or pc with internet access		
Postcondition: Teacher able to accept tuition request		

Table 5.5: Functional Requirement 4

Function: Teacher must be able to accept post		
Input: N/A	Process: Navigate to the bottom of the post details page	Output: Student session confirmed
Precondition: Teacher meets student's criteria		
Postcondition: Session Scheduled		

Table 5.6: Functional Requirement 5

Function: Student must be able to cancel session		
Input: N/A	Process: Press cancel session button after session in progress	Output: Session cancelled
Precondition: Session already in progress		
Postcondition: Confirmation, directed back to home screen after the session is cancelled		

Table 5.7: Functional Requirement 7

Function: Teacher and students must be able to communicate with each other after gig confirmation		
Input: N/A	Process: Chat feature becomes available upon confirmation	Output: N/A
Precondition: Smartphone or pc with internet access		
Postcondition: Teacher and student communicates		

Table 5.8: Functional Requirement 6

Non-Functional Requirements

Another type of requirement is non-functional requirements. The non-functional requirements are listed in this section to identify the major operations of the system. There are various types of non-functional requirements like performance, security, scalability, information, efficiency which are listed in this section. Non-functional requirements are briefly described below:

1. Availability: The system should be available online without having any trouble.

2. Information: Information requirements represent the information that is relevant to the users in terms of content, timeliness, accuracy, and format. Information is about the necessary inputs and outputs and how it will be managed, types of the required data to be stored, how currently the information will be saved into the system, how the interfaces of external systems will work etc.

3. Backup: System should back up user's data.

4. Response Time: System should respond very fast.

5. Excellent UI Experience: All the interfaces of this system are easy to understand, clean and user friendly.

6. Performance: Performance describes the acceptable throughput rate acceptable response time. Poor performance leads to poor user experience. The main reason to develop this mobile application is to let the users manage everything they used to handle manually before (e.g., hiring process). This mobile application should provide all the tuition related help a user need.

7. Efficiency: Efficiency requirements represent the system's ability to produce outputs with minimal waste. The system should use its resources in an efficient way.

8. Low Bandwidth: Users should be able to use the system in low bandwidth.

9. Scalability: The system should support huge user traffic.

10. Security: Security is always a concern. The system should have higher security as it will contain user information.

11. Extensibility: Users should be able to add, update and delete their data. The system can be expanded to accommodate many further modules without making any changes to the existing modules.

5.4 Product Features

Product features defines the functionality of the product and how it will benefit the users, and everyone involved with the system. The features of our mobile application are discussed below.

5.4.1 Input

The Shikhao application's input will be the user login and signup form. Here the user will have to input their email address and create a password in order to register or create an account. The user can also choose to automatically input the information using google or Facebook.

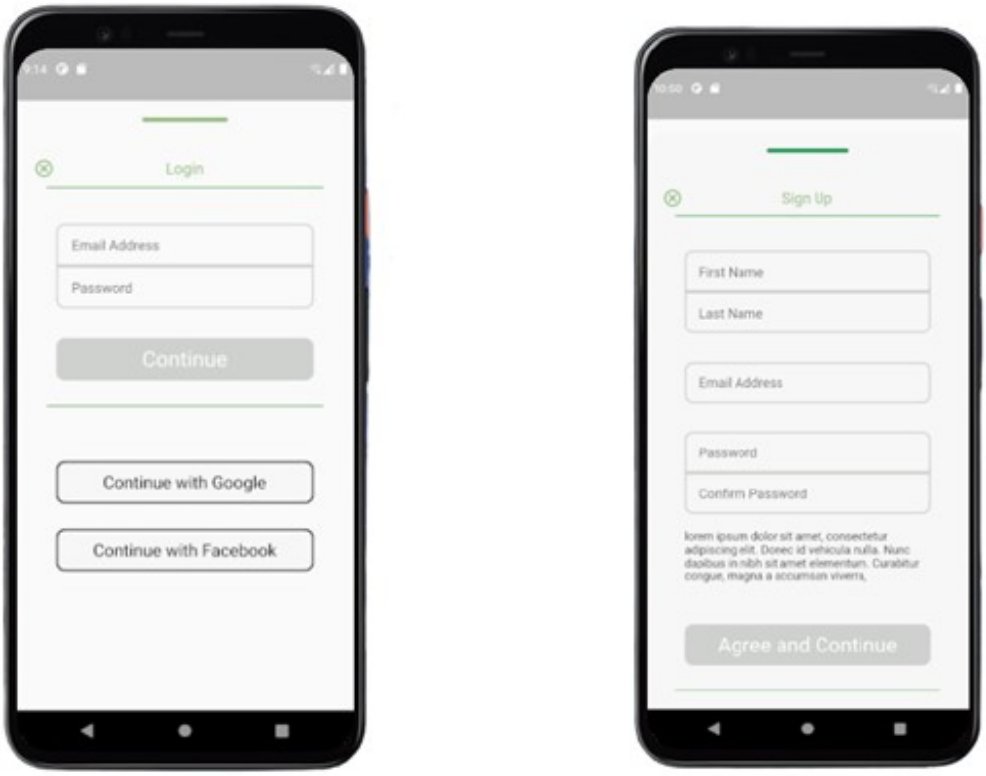


Figure 5.4: Input Pages

5.4.2 Output

Two of the main output of the system will be the post details and the post list page. Once a student makes a request, imputing all information, the teachers will be able to see the pages below accordingly.

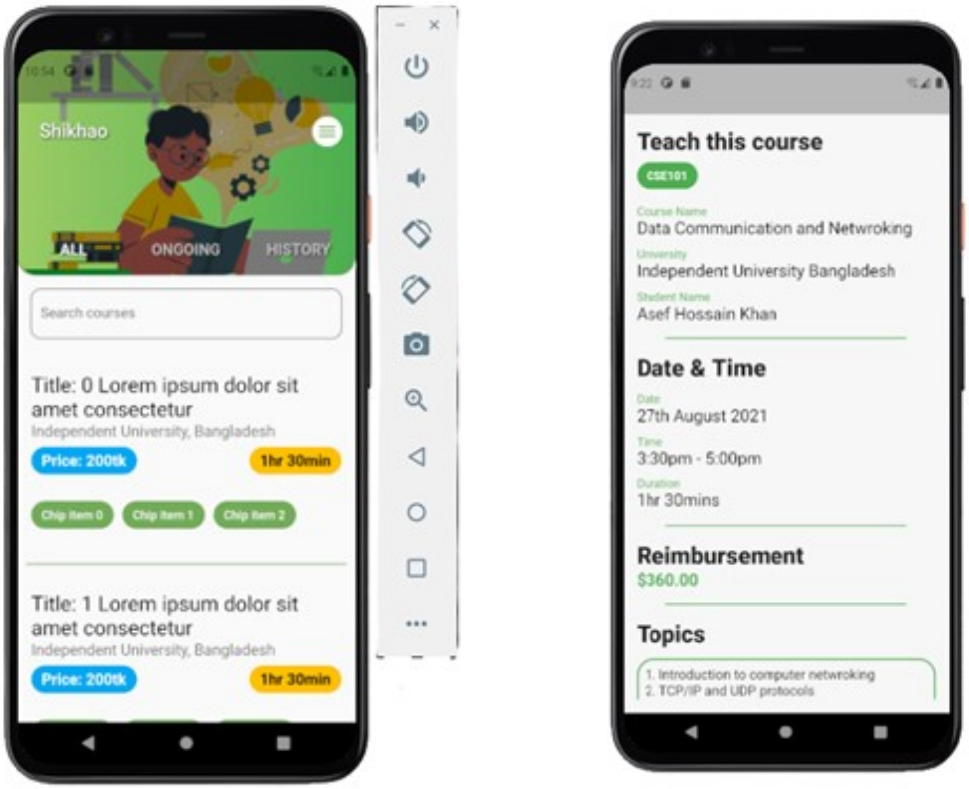


Figure 5.5: Output Pages

5.4.3 Architecture

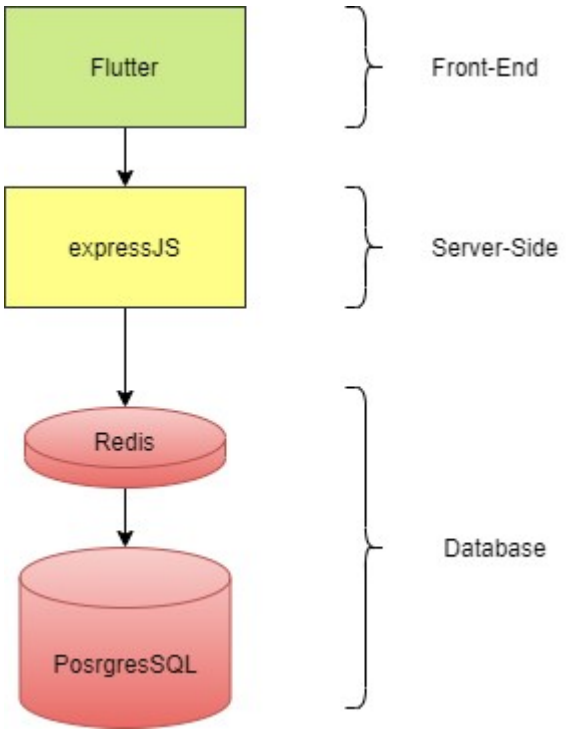


Figure 5.6: System Architecture

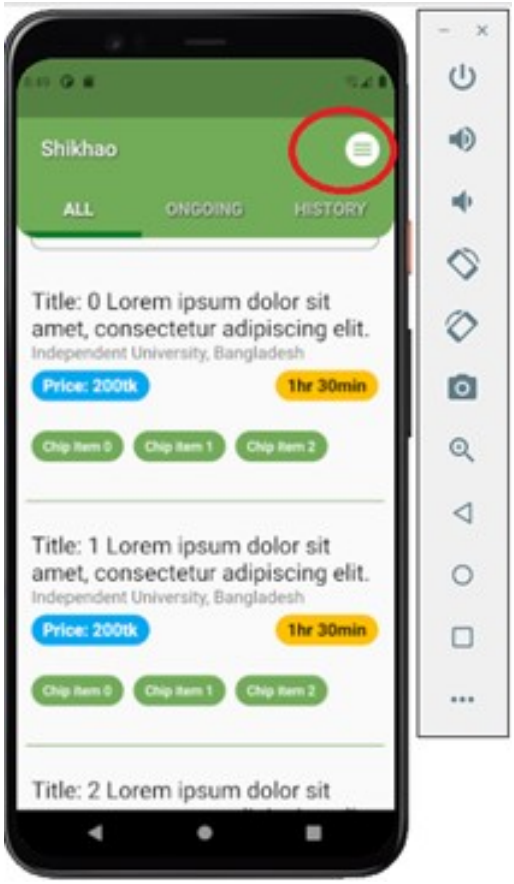
The System architecture of the system is given above. The flutter framework has been used to do the front end of the system. expressJS was used for server-side and Redis as the in-memory database for retrieving data as fast as possible from the database, backed by PostgresSQL as the main database.
This is a 3-Tier architecture where flutter is used for the presentation tier, express JS for application tier and the Redis and PostgresSQL as the database tier.

Chapter 6

Results & Analysis

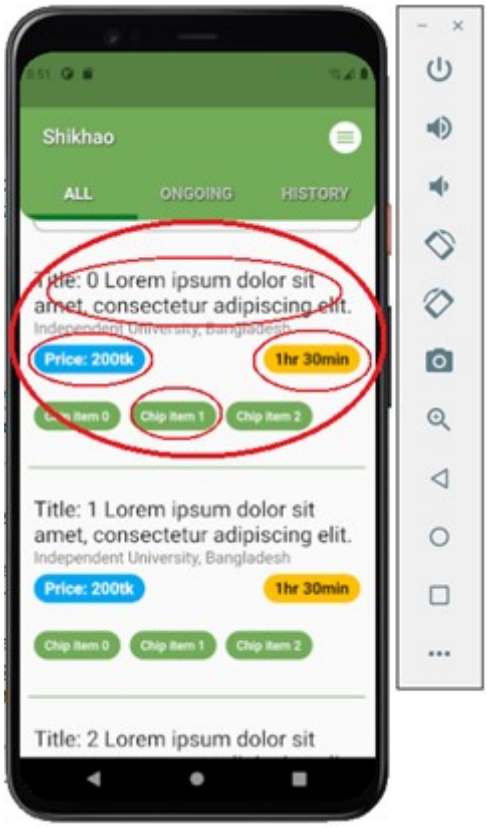
The project that Shikhao underwent was to increase its online presence and reach out to newer platforms. The aim was to create a modern looking and modern feeling mobile application that would attract any user using the app for the first time. The system at Shikhao was developed using the flutter framework in Android Studio, using the language Dart. Flutter is an open-source UI software development kit created by Google. It is used to develop cross platform applications for Android, iOS, Linux, Mac, Windows, Google Fuchsia, and the web from a single codebase. Flutter is arguably, the best tool for creating an application, at the moment. It's open-source libraries and the huge community support is driving the framework forward and has gained huge popularity recently. In terms of performance, it is only second to the native frameworks, though it makes up for the ease of learning and use. Since I joined Shikhao, the initiation, design and implementation phase has been completed and the only thing left are the testing and deployment phase. The backend will be implemented using expressJS, Redis and PostgreSQL once the integration phase begins. So far, all the pages have been implemented and the views have been tested on different devices, both by using .apk files and google, responsive UI panel. The code has been optimized for performance and thoroughly inspected by the senior developers. The pages have been approved and is ready for integration, though the colors used in the application are subject to change as the theme for the app has not been finalized yet. The senior developers at Shikhao will start the integration process in the upcoming weeks and will move forward with the project. The list below shows what has been achieved on the project, by me since the beginning of the project.

Menu Bar: A global menu button has been placed on the app bar so that accessing pages become easier. A hamburger icon has been used, which upon clicking shows the list of all the pages.

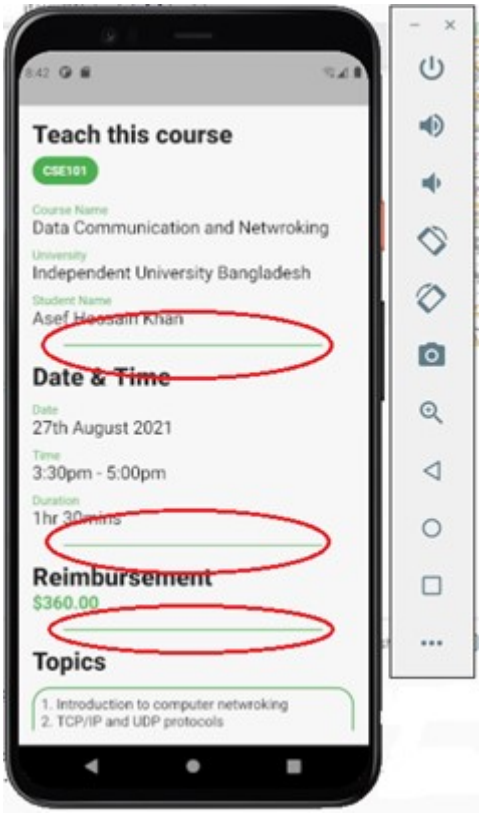


Sliver AppBar: A Sliver AppBar in flutter is an app bar that expands and contract upon scrolling down and up respectively. Instead of going for a traditional static app bar, we decided to go for a sliver AppBar because it adds a very UX to the application. The subtle animation makes the application feel modern and appealing.

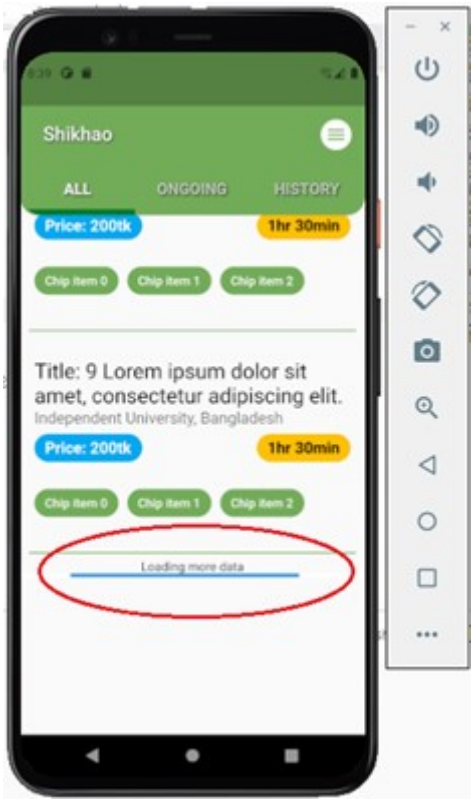
Post List: The team at Shikhao put a lot of emphasis on the UI/UX perspective of the post list that the teachers are going to see. I tried my very best to keep the UI simple but not to compensate the important information of the posts. The idea was to make sure that all the important information of the could be understood in one grasp.



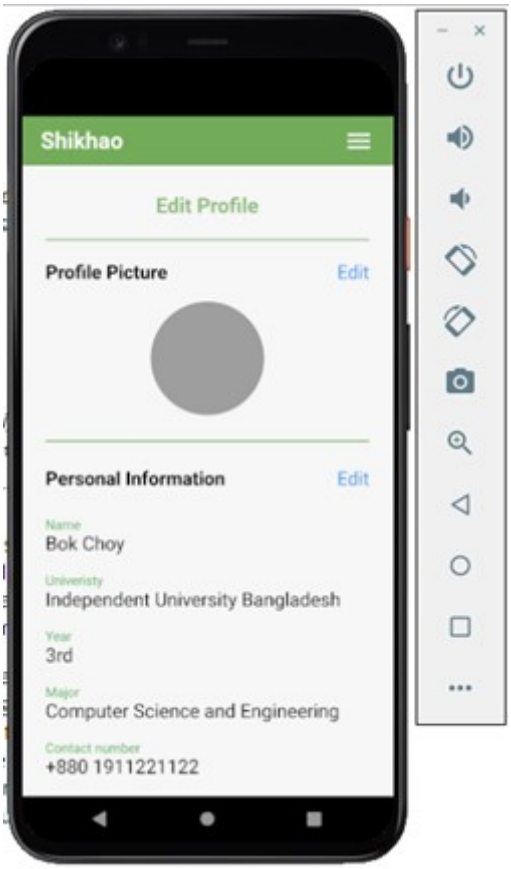
Post Details Page: The post details page perhaps contains the most information amongst all the other pages. Thus, it was very important to make sure that words and information don't clump up together which is lead to poor user experience. Instead, we used horizontal lines to separate, and the sections of information and we used different size and colors of text to emphasize on the words.



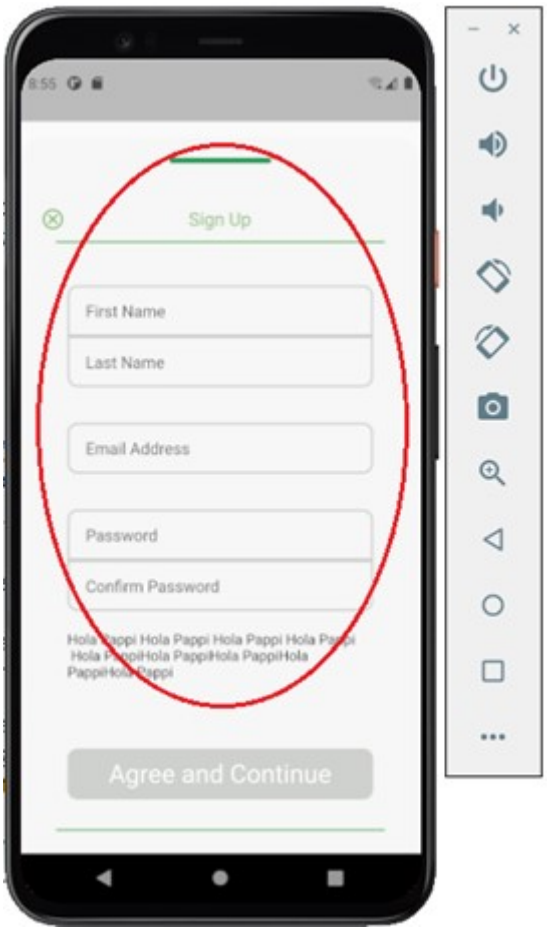
Loading Animation: This is the animation that I created in the post list page, the amination that will show what we are waiting for the data to arrive from the database. We had to think about this part of the project of a bit in terms of UX as users do not like to wait and finally decided to give it a fixed time of 4 seconds (for now) so that we don't compromise either the performance or the UX.



Student Edit Profile Page: For this page, we tried to keep the layout as simple as possible, simultaneously, keeping it with in standard. We went with an edit profile page that is to understand and edit, we also sectioned the information for easy navigation.



Sign Up and Login Form: The signup and registration forms were kept simple and up to standard. It was made clear that I could not use a custom form and was given a template to follow so I followed a AirBnb form and styled it according to Shikhao's theme.



Chapter 7

Project as Engineering Problem Analysis

7.1 Sustainability of the Project

At some point in time, all projects or work must come to an end but the impact the product has should carry on, preferably till the end of time, or at least for the duration that it was designed to last for. In this paper, I have categorized the sustainability of my work into three categories: organizational, financial and community sustainability.

Community sustainability: Community Sustainability is how the product is carried on with-in the community over time. The project being developed at Shikhao can achieve community sustainability, much like any other tech-startup companies, with regular and incremental patches and updates. Listening to the community feedback and demand is essential here and over time a strong brand image can be formed to thumbtack the application within the community.

Financial sustainability: Financial stability is a characteristic of a financial system that dissipates financial imbalances that occur naturally in financial markets or as a result of substantial adverse and unforeseen events. The business models in Shikhao were shaped with financial sustainability in mind. The company hopes to generate revenue through AdSense and commission from tutors through the application.

Organization Sustainability: Organizational sustainability entails having the leadership, talent, global knowledge, and change strategies required to meet the particular problems that businesses face today [13]. Shikhao has plans to expand beyond app and within the ed-tech industry, with new projects like offering curriculums and online classes being planned. Shikhao can be sustainable in the long run, as long as they keep innovating and expanding their boundaries and reach, much like any other tech companies out there.

7.2 Social and Environmental Effects and Analysis

Much like any other digital invention, an application will always influence the environment and society. An Ed-Tech company without doubt is expected to leave a big and positive footprint.

Social effect: One of the key components of an ed-tech company is the scale, it is about understanding how many people this solution is reaching. The social effect of Shikhao, given that it is startup company, is very low at the moment. But all this can be changed drastically as soon as the app launches, with proper marketing and campaigning. The positive social impact of the app, given the business model, is anticipated to be very high, changing the way tuitions are done at universities.

Environmental effect: The environmental impact of the application being developed at Shikhao is very low. There are no possible scenarios where the result of the application could harm the environment. Once the application gets up and running, the only interaction will be between the student and the teacher and the location that they choose for the tuition can be one of three: at the teacher or students' home, at university or online. Therefore, arguably the only environmental effect may be ones due to the usage of electricity.

7.3 Addressing Ethics and Ethical Issues

Overall ethical issues for an application are similar for most any marketing ethics. Things like false promotion, price issues, age/gender/race issues, etc. Consumers (users) of the application must not be exploited and there should not be any unethical bias in the system for the different type of users. Shikhao has strong policies complied with international standards to tackle problems like plagiarism, discrimination, harassment and more, extreme cases lead to the users account being banned.

Also, consumers put a lot of trust in system developers as they are sharing their data to the system. That is why security is always a priority. Luckily, Google security services for the flutter framework takes care of almost all security issues. JWT authentication process is used to exchange information between the users in the system. JSON Web Token (JWT) is an open standard (RFC 7519) that defines a compact and self-contained way for securely transmitting information between parties as a JSON object. This information can be verified and trusted because it is digitally signed. JWTs can be signed using a secret (with the HMAC algorithm) or a public/private key pair using RSA or ECDSA.

Chapter 8

Lesson Learned

8.1 Problems Faced During this Period

My internship at Shikhao was nothing short of amazing, I got to learn so much in such little time from experts in of the industry. I also got to learn so much about the mobile app development sector.

The biggest limitation of my internship was adapting to the work environment and getting along with the people of the company. Being an introvert myself, it was difficult for me to open up to everyone, thus creating a communication gap. This led to a slow start to my work at the beginning, especially when it came to making changes and finalizing the designs. I was also tested positive for Covid-19 during my internship period for which I had to pause my work for a little while. Overall, there were quite a few interruptions of my workflow for which I had to compensate and work overtime so that we don't fall behind on schedule. Also, the way the Gantt chart was made, there was very little wiggle room which was also a very big challenge as I had 3 other courses to attend to at University, I had trouble keeping up with both school and work, especially during exam weeks.

8.2 Solution of those Problems

The problems that I faced during my internship were more of personal problems than anything. I learned that I have to be more open and communicative when starting work at a new environment, this includes have confidence in the work that I'll be doing. Once I opened up and stated communicating freely, I saw that work was being done faster and everybody was willing to lend a helping hand, specially to an intern.

Doing my internship alongside university also taught me that when dealing with huge volume of work, I should not procrastinate or slack of. When the workload piled up, especially during exam weeks, I had to stop doing all forms hobbies of entertainment and just to nothing other work and study. This is coming from someone who was heavily invested in esports and esports tournaments amongst many other extracurricular activities.

Finally, the fact that I was affected by Covid-19 was out of my control and was in God's hands. Staying in good health is always important when working for a company as it being absent not only hampers your personal work but also puts the team behind.

Chapter 9

Future Work & Conclusion

9.1 Future Works

Though the tasks I have been assigned to have been completed, the project at Shikhao it is still at the development phase with testing and the deployment still needed to be done. As all modern-day software and application, our app will also go through regular patch updates upon release which is improve the performance of the off, UI and UX. To the best of my knowledge, the following will be applied to the future work of the project, besides patch updates.

• **Transition Animation** – Shikhao hopes to add a custom animation during page transitions, something like the bkash app where the logo is animated while we wait for data to be fetched from the backend. This custom animation will add a sense of branding for the company.
• **Icon Animation** – Though this is planned for the distant future, icon animation has big impact on the performance of an app and must go through vigorous testing, but this will be a feature of the app in the future.
• **API integration(s)** – Shikhao will be using custom rest API in order to collect data, Shikhao will use the firebase authentication API to authenticate its users, both of which will be developed at a later time.
• **Dynamic Chat feature** – Shikhao also hope to add a dynamic chat feature to it's and this will be implemented before the app is released. This will give the students and the teachers the ability to chat with each other once a session has been confirmed.
• **Course offer feature** – Shikhao hopes to someday, offer courses of their own, where students can enroll and learn something different and improve their skill set, there will be a separate section inside the app where they will be able to do this, which will be developed along the way.

9.2 Conclusion

With the front-end part of the project almost finished and my part of the internship project coming to an end, I can confidently say that my both me and my superiors are satisfied with my contributions.

The time spent and the experience gathered at Shikhao was beyond amazing. I learnt so much in the 3 months of working at Shikhao. I had the privilege of working with an industry leading technology like flutter along with experts of the industry who have contributed so much to the community. I was able to get a peek at the world of mobile application development and the culture surrounding it. There were many hurdles, but the positives weigh more than the negatives. Some of the most positive things that I got out of it was being able to learn about responsiveness, industry standards and the workflow of app development. The job taught me to work independently, be patient and always ask for help when needed. My programming skills and googling skills has increased multiple folds, and I am thankful to have been a part of such an experienced team that helped me with all kinds of problems. I hope to someday make it into this industry and make my own contribution to the community, a community that I fell in love with during my internship.

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