

Final Year Individual Project (SEGM)

[55-6727]

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Confidentiality Required?

NO

YES

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Abstract

Freelancing has become a rapidly growing trend in many fields with the development of technology and industrial revolution. The trend “freelancing” has been evolving from the early 1820s to the present providing a vast range of employment opportunities in most of the fields. It has been mostly popular among the IT field for the past few years which has lead different freelancing websites to share various jobs and project among employers and employees to complete their tasks. Although vastly evolving fields like IT uses freelancing, day to day jobs that are needed to be completed such as plumbing, cleaning, repairing, gardening etc still uses the most common word of mouth way of communication or recommendations from friends. Even the employees such as repairers, plumbers, gardeners & cleaners face difficulties in finding proper jobs for a particular rate.

“Work Hub” freelancing mobile application was developed as a solution for this problem in particular to the Sri Lankan community. This application allows a person who is seeking a job offer (employee) to post his respective field of work he is skilled at, with his rates while a job provider who is finding a person for a particular job (employer) can post the job for which he/she is finding an employee through the mobile application. The application also consists of a news feed where posts from job seekers and job providers can be seen at once when a particular user logins to the application.

Moreover, in this application a rating system is introduced so that job providers will find it easy to select the best employees according to their ratings. A job provider will also be able to review an employee which will be helpful for the other job providers when finding a suitable employee.

A separate profile will be created for users who signs up to the application which allows a job provider or a job seeker to go through their ratings & reviews including name, contact details and addresses.

A search feature is also included in this application in order to find the best match using predefined keywords. Therefore when a job provider searches a specific title or a job, suggestions from the search will be shown to the job provider after filtering jobs according to the predefined keywords by the job seeker.

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1. OVERVIEW

1.1. Introduction

Unemployment has become a common problem in most of the countries throughout the world. Sri Lanka, being a developing country is facing severe problems due to the rate of unemployment. One of the main reasons for this situation has been arisen due the outmoded education system that is still been followed by the Sri Lankan education system and other being lack of skills. It appears that there are still a higher rate of demand for people who have higher education level than the people with a lower literacy rate. Non existence of a proper employment system in Sri Lanka has being the main reason for this problem. An employee who does paint jobs, carpentering, gardening, plumbing, etc have being underestimated buy the society as rates and wages for those types of jobs have been under valued than the jobs of an educated person. A statistical representation of the unemployment rate for the past few years in Sri Lanka is listed below.



Figure 1.1 Unemployment Rate

Although the unemployment level has been reduced throughout the past few years in Sri Lanka, there are still low income earners who does day to day jobs like plumbing, carpentry, gardening, etc. The families of these type of employees totally depend on the requirement of their service by another party. Although day to day services like plumbing, carpentry, gardening, painting are named as low income earning jobs in Sri Lanka, they are services which are paid in higher rates in other countries throughout the world. This has mostly been critical in Sri Lanka due to the cultural and ethical differences that prevail in the country.

Finding a job for a job seeker or finding an employee for a job provider has been evolved to the finger tips from the evolution of modern technology due to freelancing. Although freelancing has been evolved in most of the fields like IT, medical, education, etc to get job opportunities easily, day to day jobs like plumbing, carpentry, gardening and painting still uses the traditional way of word of mouth communication or recommendations from friends when finding an employee. This has created a huge employment problem for both employers and employees.

Employers find it difficult to find a proper person to get their job completed on time as it is very hard to find day to day working employees on a single phone call. We will have to call some friends, get recommendations, find methods in contacting the employees sometimes which is a huge waste of time and energy due to the demanding of higher rates by the employees. And visa versa, employees find it difficult to find day to day jobs as he has to stay till someone contacts him/her in need. This has been a huge problem both to employers and employees due to the non existence of a proper system for day to day jobs.

“Work Hub” freelancing mobile application is specifically developed for the Sri Lankan community as a solution for this huge problem. It acts as a mediator between both employer and employee allowing both parties to contact each other for their specific needs and requirements. By using this application, employers and employees would find it much easier to find particular job as a job seeker or provide their services as a job seeker.

1.2. Aims of the Project

The major aim of the “Wok Hub” freelancing application is to create a job pool where a particular user can post a job to the job pool and another user who is finding a similar job can contact the employee via the application to get the job done. This would make it easy for both the employees and employers to find suitable matches for their jobs.

Another aim of this application to create a user profile which includes the job information the users have posted. By creating an user profile to each and every user, other users who are seeking their service or providing them with a services will be able to have background information such as contact details, address, email address and the jobs that has been posted by that particular profile.

Another objective of the application is to provide the users with the best employers or employees for those particular jobs. To accomplish this objective, a rating and a review system will be introduced to the system. An employer who is hiring an employee for a particular job will be able to see the rating and review he has been received form the previous jobs he has completed. This will give the employer a good idea about the skills of the employee from the star rating he has received. The review and rating system can also be applied to the employees when they are finding job providers. They will always have doubts in their employers whether they will be paid according to the agreement. When going through the rating and review of the employer, the employee will also have a good idea about the past jobs that were provided by the particular employer.

Moreover, the users should be able to search for jobs from the pool. For this purpose, a search feature will be added to the application in order to search for jobs by key fields. Through this feature a user will be able to login to his account and search for a job he needs employment which would show the matching jobs according to the search.

Another aim of this application will be to find the destination of the user. For this purpose Google Map feature will be added to the application. Through this feature, when the user gives his address, other users will be able to find the location of the user on the Google map which will allow them to navigate to the particular location. This feature would be mostly useful to find jobs or employees for users near their location.

1.3.Background

A background research had to be conducted on various freelancing applications that have been already developed before starting to develop the application. Through the analysis, it was found that there are many freelancing applications existing with different features included in them. Various studies had to be conducted in order to analyze those applications and to get the best practices out of them.

The most famous freelancing application available is [freelancer.com](https://www.freelancer.com). This application allows employers to post their projects and the freelancers who are available could bid and get the job. This application also handles all the payments securely for both parties. This application also has a messaging feature which could be used to communicate for the employee and the freelancer to be updated on the projects.

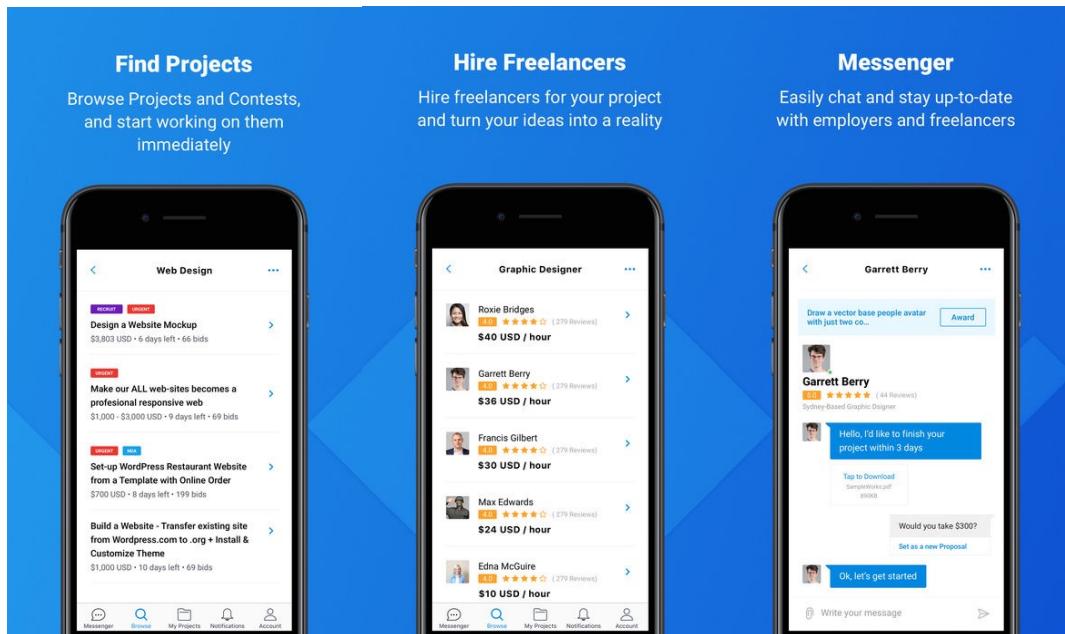


Figure 1.3:1 Freelancer

Another application that was referred is the UpWork application which also had similar features such as messaging, bidding, job posting, etc. It contains the skill level of the employee which will be useful for the employer when hiring a particular employee.

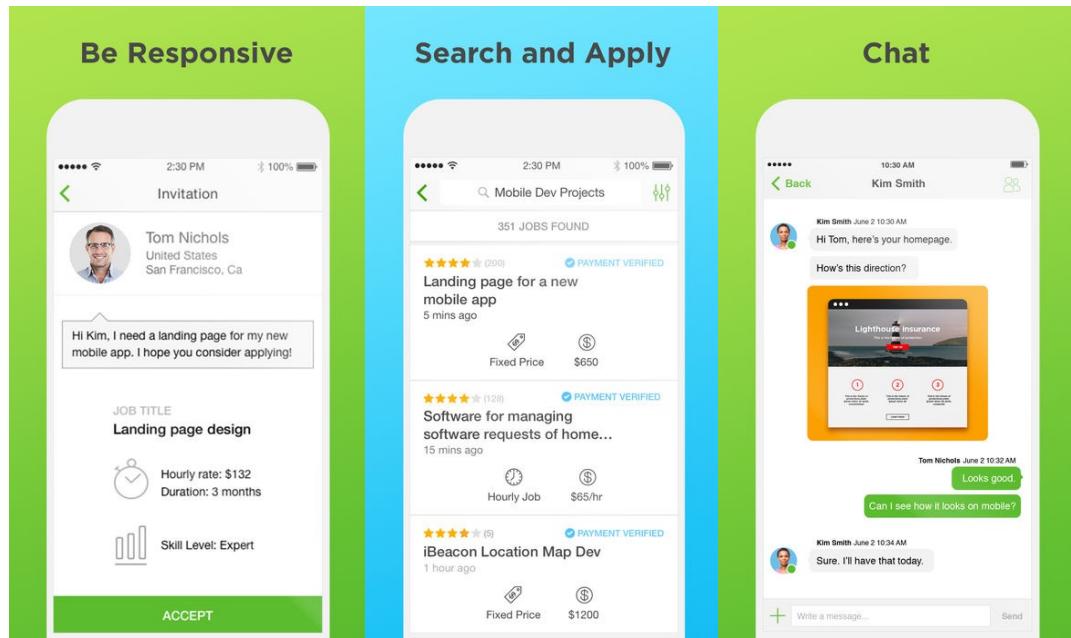


Figure 1.3:2 UpWork

Fiverr is another famous freelancer application used by many individuals globally. It has a pool which contains entrepreneurs, experienced freelancers and various businesses that deal with each other in completing their projects. It has been acting as a digital market place providing a variation of services around the world.

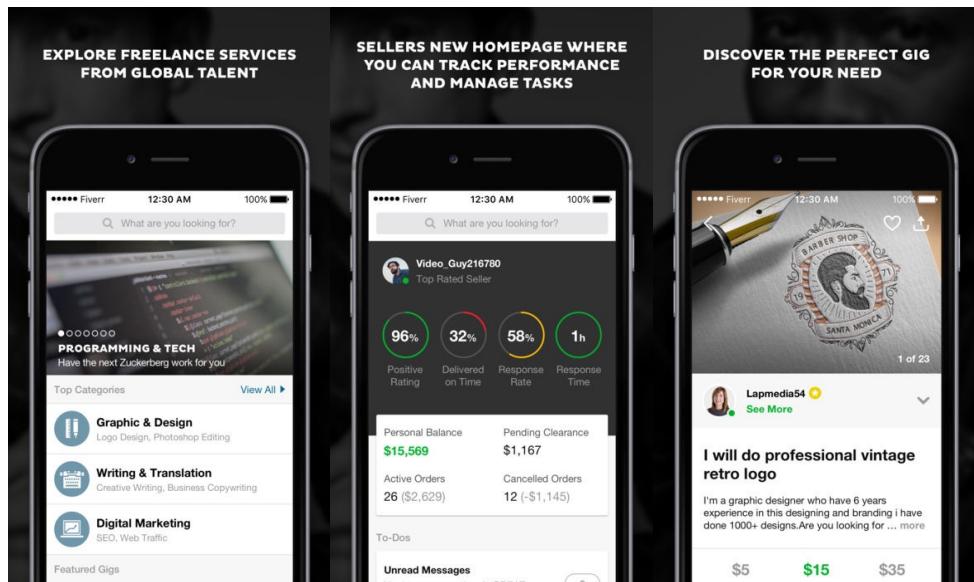


Figure 1.3:3 Fiverr

2. PROJECT MANAGEMENT

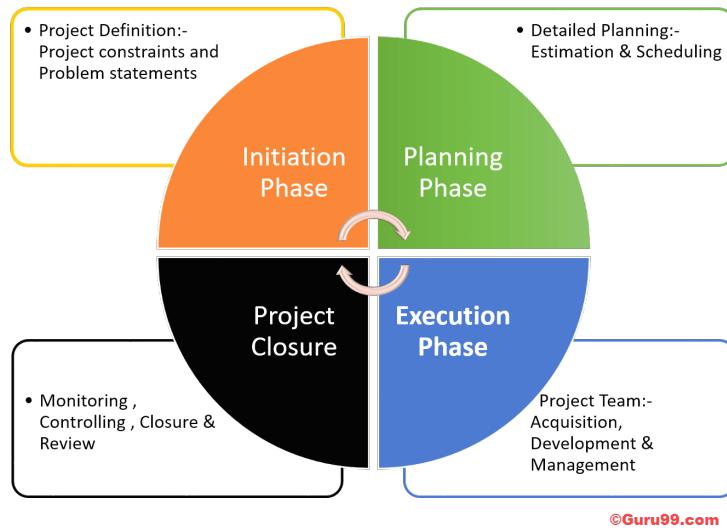


Figure 2:1 Project Management Life Cycle

2.1. Project Definition

During the phase of the project definition, the main constraint that had to be considered was the scope of the project. Analysis had to be conducted in order to identify whether the project could be realistically completed within the given time frame. Time constraint was a major issue when dealing with the project scope. The practicability was another constraint that had to be identified in the project definition stage. Best practices had to be identified from various existing applications in order to identify the functions that should be applied in the application.

2.2. Project Planning

All the necessary tasks had to be planned according a particular schedule in order to meet the requirements of the project within the given time frame. The required resources for the project were also studied during the process of planning. Since the project was planned to be done as a mobile application, the required technologies and languages had to be studied and learnt before initiating the development process. The most appropriate tools and softwares were selected after analyzing various tools considering the appropriateness of those tools and softwares to the project.

As this project was an individual process, planning of the functions and required tools were very important as knowledge and skills regarding various technologies should be

analyzed and used within the given time limit. After analyzing many projects and plans that have been followed within them, it was identified that most of the projects that have been conducted according to a predefined plan and a time period have been able to successfully complete the project without any issues. Having a proper plan also reduced the cost of the project when considering commercial projects that are undertaken by various teams.

The functional requirements of the project were to be concentrated mainly to be finished within the given time frame as this project was to be conducted individually. For this purpose, all the functions that had to be developed were broken down into subtasks with deadlines assigned. The below mentioned chart shows how the task breakdown was done.

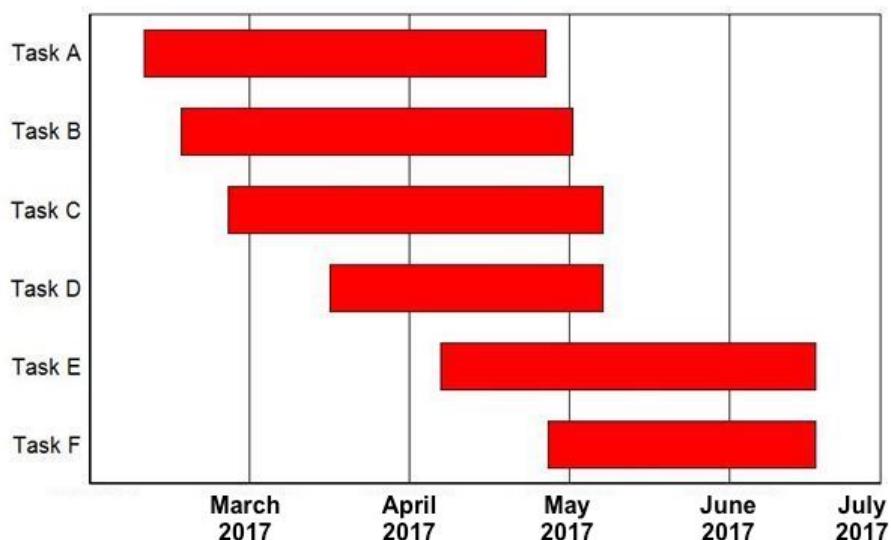


Figure 2.2 Task Breakdown Chart

2.3. Project Execution

Developing the freelancer mobile application was challenging as different technologies that weren't familiar had to be used. The planned functions and the pre considered technologies have been combined in order to come up with a final deliverable. A method like waterfall or iterative waterfall were not practical with the situation of the application. Therefore Agile method has been followed considering various factors.

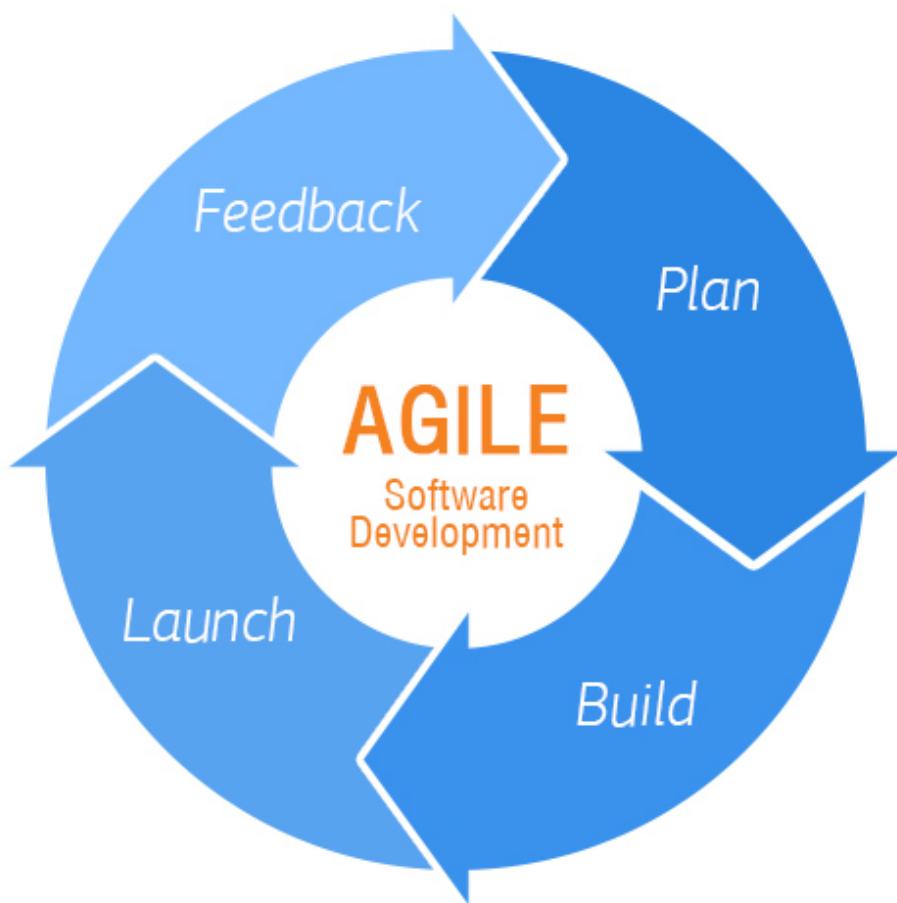


Figure 2.3:1 Agile Development

When developing the application, agile method was more practical to be used than waterfall or iterative method as when using agile method, testing will be carried out after each subtask of the software has been developed. Therefore testing will be carried out with the development process that allows the developer to be flexible in changing various components after testing which would make it easy for the developer. The use of agile method also allows the developer to think in advance of the other functions that are to be built and planned when testing is carried out within the development process. Test driven development was the best approach to be used due the flexibility it provided while developing to meet the exact requirement within the given time constraint.

As the project was mainly focused on the functions, feature driven development methodology was planned to be used in this development process. This concept can be mostly applied in projects which are based on functions. As the freelancing application had many built in functions to be implemented, feature driven development was considered as the most suitable concept to be used in developing the application.

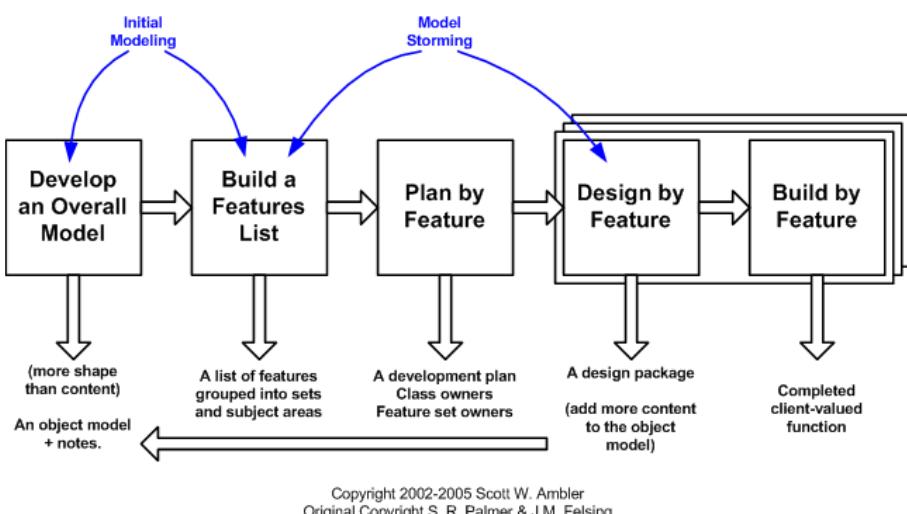


Figure 2.3:2 Feature Driven Development

2.4. Project Closure

This phase mainly focuses on releasing the final deliverable to the clients. In this stage the process success could be identified according to the feedback given by the users of the application. This phase is so important in order to evaluate the lessons learned from the application development and the future changes that have to be made in order to improve the quality of the product.

During the project closure, evaluation could be done in order to identify the success or failure of the project that has been carried out. The product could be given to the users and the feedback received could be used as a guideline for further developments or changes that had to be done in the future.

3. DESIGN AND DEVELOPMENT

3.1. Requirement Analysis

The main requirement when developing the “Work Hub” freelancing application was to develop a method that would allow a user to post a job to a job pool and for another user to hire a particular employee from the job pool.

Another factor to be considered is allowing the employer to access a map which shows the destination of the job poster. This would allow the employer to find employees nearby his location. As a solution, Google maps API will be included in the system allowing the users to access. This would also allow users to use the navigation feature within the application in finding the destination including the shortest path with estimated distance and time.

Another requirement that should be considered is to develop a method how the employers would know the quality and skills of the employees. As a solution for this problem the user accounts will be allowed for reviewing. When an employee has completed a job, the employer can write a review on the employees account. This would help the employers who are willing to hire employees to select the best reviewed employees.

Although every job posted will be shown on the pool that has been created, there should be a method to search jobs according to the requirement. As a solution for this problem, a search feature will be developed on the application which will be based on the skill of the employee. Therefore when the employer searches using the skills he requires, suggestions will be filtered and shown.

After the employee is selected for a particular job by an employer, he should be able to contact the other party. As a solution for this issue, call, message and email features will be added to the application so both the employer and employee will be able to communicate without any problems.

Finally, security factor should be considered for the job details. Accounts with login credentials will be created for each and every user when registering to the system at the very first time. This was taken as a security measure for all the accounts. But if the password is misplaced, another solution should be considered to recover the password. As a solution for this matter, a “forgot password” button will be added to the login screen which will automatically send a password reset link to the respective email address that would allow to reset the password of the account.

3.1.1. Functional Requirements

- **User Login and Registration**

Any user who wishes to use this application must login to the system after registration by entering their name, email, passwords. A user profile will be automatically created for each user when he registers. Anyone cannot enter into the application anonymously without any login credentials for security purposes.

- **Post, Update and Delete Jobs**

A user who wishes to find an employer can post a job entering the job title, budget, location, details, skills and contact details to the job pool.

- **Search Jobs**

A user can search for jobs he wishes to hire employees by typing the required skill on the search field.

- **View Profiles**

Before hiring an employee, an employer can look into the employees profile to view the contact details, previous jobs and reviews which are posted by other employers. This will be useful in deciding the best employee for the job.

- **Review Profiles**

Profiles could be reviewed by other users which will be helpful for both employees and employees when selecting particular jobs.

- **Get directions for the job poster's destination**

If some user wants to look into the destination that is mentioned in the plan, he is given an option to access google maps and see a Pin point on the destination. If he further wants to navigate or find the route or travel time, the application will redirect to the Google navigation

- **Password Reset via an Email**

If a user forget their password for the account, all the trip details are inaccessible. As a solution to this problem, a link will be the particular email address to reset the password. This was taken as a security measure.

3.1.2. Non Functional Requirements

Scalability

Scalability should be concerned in any type of application to retain the targeted clients. Almost every application does not succeed at the first stage. They take time to be fixed and refined according to the client requirements and when users start using the application, problems arise with increase in users. Therefore a developer should always think big about the scalability factor. In this application, as a strategy to the scalability factor, the application's database has been built on a cloud platform where it would be easy to scale up in case of increase in users.

Maintainability

When some changes have to be made in the application after development process is completed, it will be hard to identify the code segments. It would be a best practice to have clear names and documentations in the applications which would make it easy later if any changes need to occur. As a strategy for maintainability in this application, agile practices have been followed. When starting the project having a basic architecture would be easy for expansions later without making it complex that leads the developers in trouble when adding new features.

Reliability

In the real world scenarios, reliability factor is difficult to be achieved due to the strict time constraints given for project completions. To overcome this situation to some extent, application reliability testing can be performed in order to identify the functionality defects of the application prior to the release so that developers can find solutions for the defects. For an application to be reliable, it should always run without any failures or errors in a specified environment in a given time period.

Usability

A successful application should always go beyond functionality and focus on the usability factor when planning. Usability is a key factor which reflects the user's perspective mainly in a mobile application. In order to satisfy the targeted clients according to their requirements, measures have to be taken in order to get ahead of the needs of the clients and identifying their major goals. In order to accomplish the usability factor in this application, a user-centered design has been introduced which reduces the number of maintenance builds and bug fixes after the application is launched to the targeted clients. Usability engineering will be applied in order to identify users' needs for client satisfaction and success.

3.2. User Interfaces Design

When considering the mobile user interface designing, the requirements are significantly different from those of desktop devices. Due to the smaller display size and touch screen control capabilities, special considerations have to be taken in order to ensure readability, consistency and usability. Considering all those matters, analyzing and researching had to be undertaken in order to figure out the user interface designing and development techniques comparing various mobile applications' user interfaces that are used more frequently. Considering various key factors identified through the UI designs gone through some of the best practices were identified.

- The layout of the content and commands in a mobile application should be similar to those of the operating system in placement, color schemes and styles. When the application is consistent with the operating system, it allows the user to learn to use the user interface much quickly.
- Usability of the click points is another factor that should be considered. Click points shouldn't be too small or narrow in any direction, to avoid unwanted selections.
- The user interface should always be kept simple for the user. Display of a number of unnecessary controls and interactions may make a user confused.
- The user interface should not unnecessarily dominate the screen as the screen is small compared to other devices. It is much necessary to understand that the content is the most important factor to the user, not the user interface.

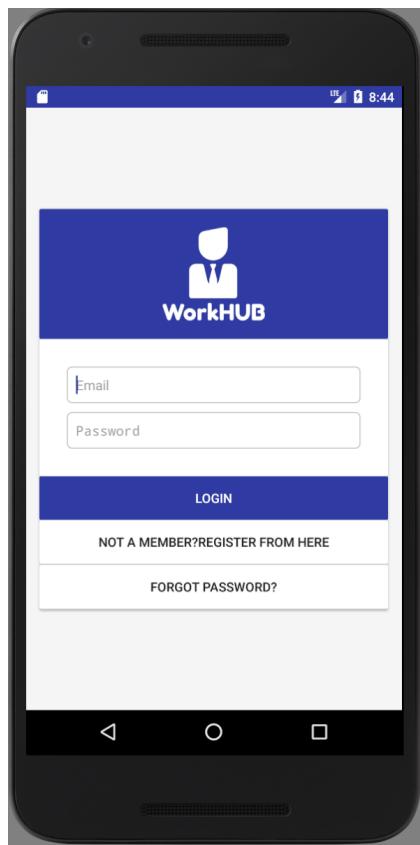


Figure 3.2:1 Login

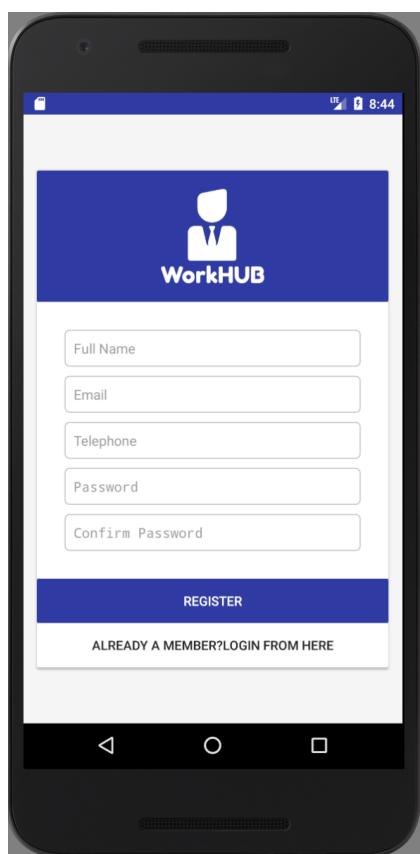


Figure 3.2:2 Registration

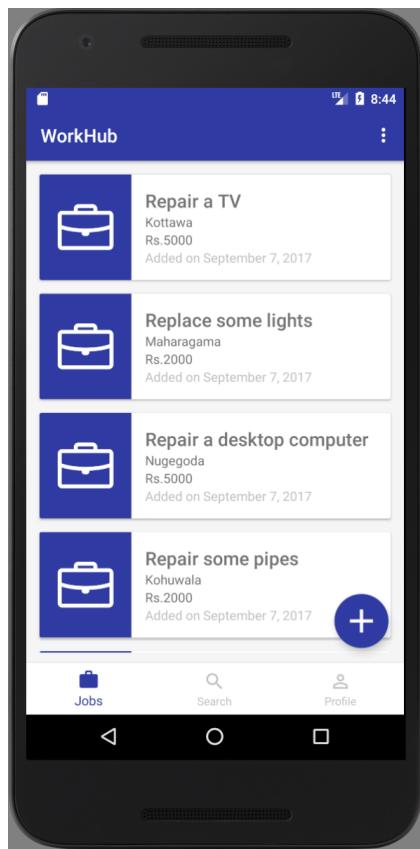


Figure 3.2:3 Jobs Home

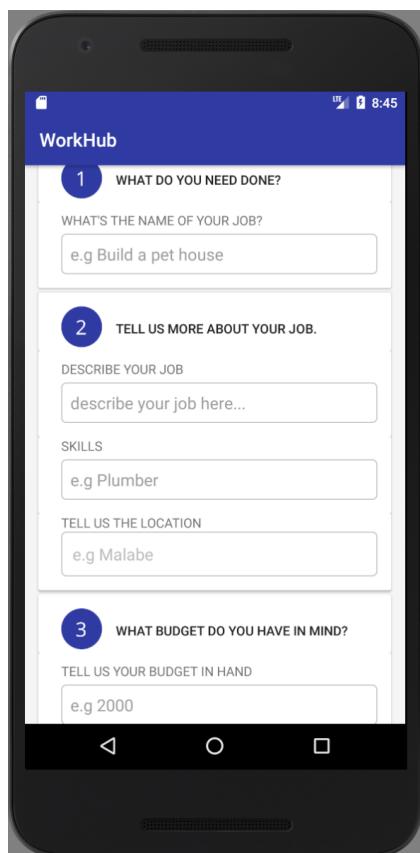


Figure 3.2:4 Post Job

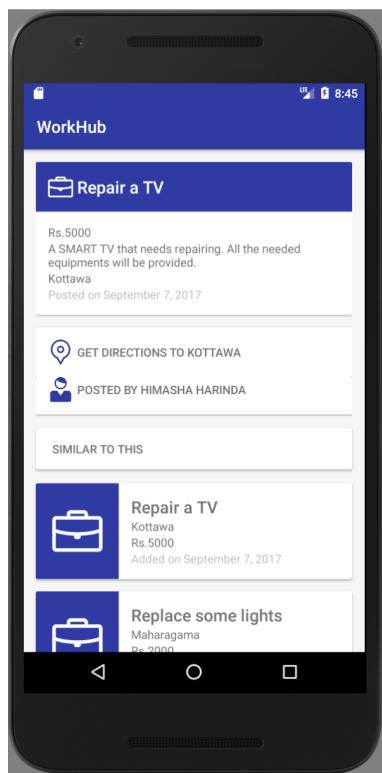


Figure 3.2:5 Job Details

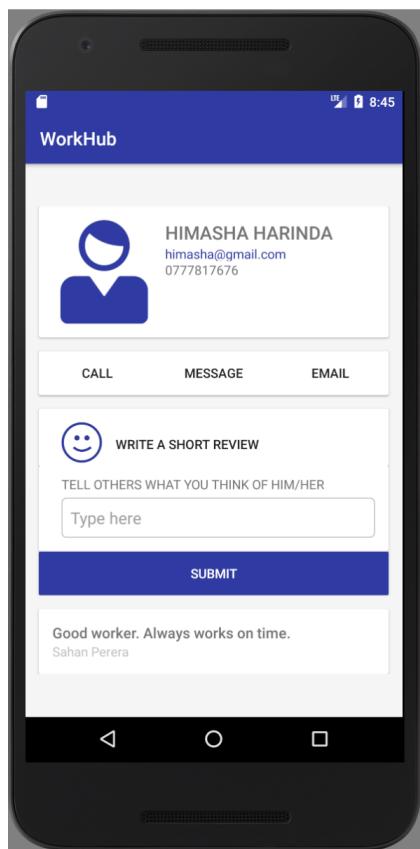


Figure 3.2:6 User Profile

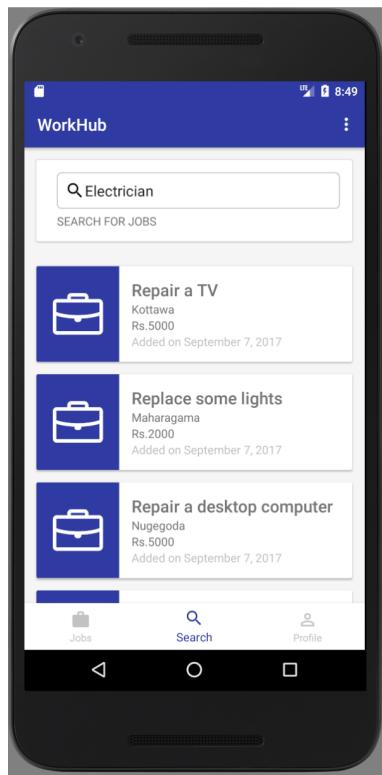


Figure 3.2:7 Search

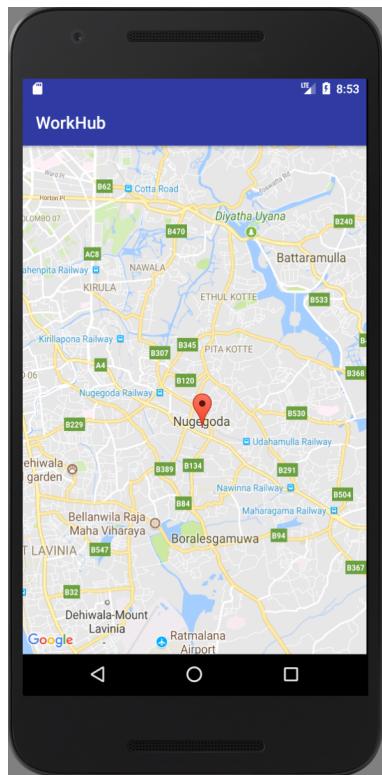


Figure 3.2:8 Search for Destination

3.3. System Development Tools

Firebase

Several factors have to be considered when selected the appropriate database technology. After studying various factors, it was chosen to use Firebase which is powered by Google as the database technology. One of the main reasons for choosing Firebase was the reason for it being Cloud based. Data can be stored virtually and be accessed from anywhere in the world. As Firebase is a realtime database engine, it always synchronizes all the data from the devices to the cloud within milliseconds. There are no issues like push notifications as the database system runs realtime. Unlike SQL databases, in Firebase, data is stored as JSON objects. When a developer makes some changes in the database, it is synchronized real time to the cloud database as a node in the existing data structure. Another significant feature that can be seen in Firebase is availability of a schema-less architecture. As the database engine is schema-less, there are no tables and records to be shown in the database design. Availability of a schema-less database architecture makes it easy while developing to make any changes required.

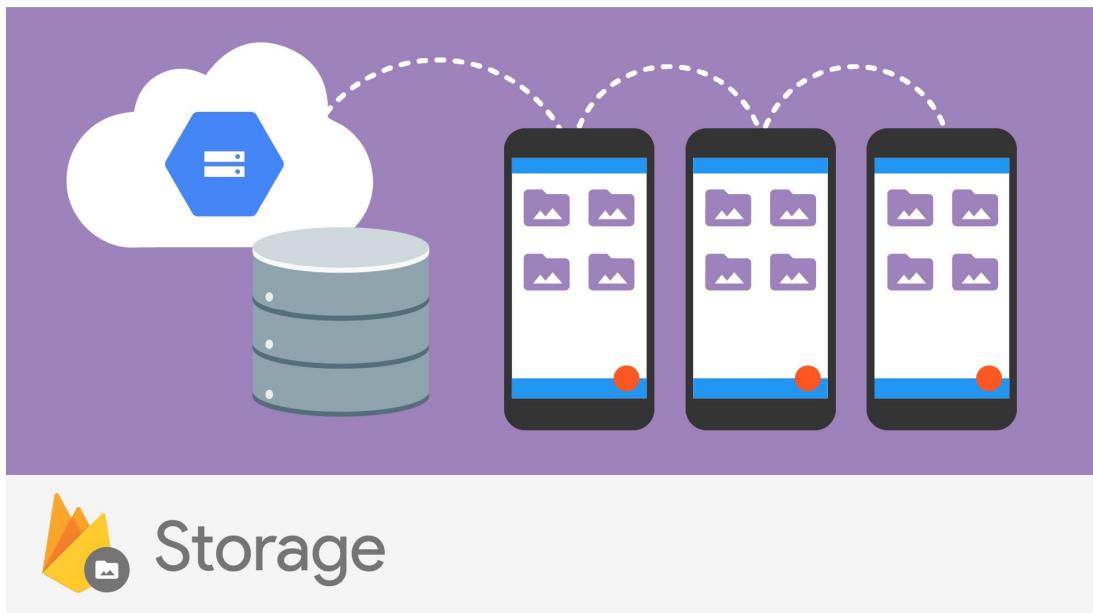


Figure 3.3:1 Firebase

Android Studio

As this application was designed for android users, it was decided to use the Android Studio IDE which has been named as the official IDE for android development. As Android Studio IDE runs on top of IntelliJ's code editor and developer tools, it allows a developer to use more features on order to enhance the productivity. One of the major reasons to select Android Studio was because the IDE was flexible, fast and it contained an emulator which contained a lot of features. The availability of an emulator has been very helpful when testing the application while developing. Another reason considered in selecting the IDE was the ability to access cloud bases databases that allowed the developers to add more services to the application.



Figure 3.3:2 Android

Java

As the backend development programming language, Java has been used as it is object oriented and the mostly used language in Android development. It would be easy even for any other developer to understand what has been done as Java is a universally used programming language.

XML

XML has been used in this application for encoding rules in machine readable format. It is mostly popular for sharing data via the internet.

GitHub

A version control system is essential in application development as developers constantly changes codes and release newer versions which sometimes doesn't work. There occurs some situations that the developer isn't able to revise the application to the earlier version. In using GitHub, modifications done to the application are stored in the central repository where developers are given the opportunity to download the application, do necessary modifications and upload the newest version. This also could be used as a backup if something goes wrong while developing.

Google Maps

The Google Maps SDK has been used in the application to add the map in order to show a specific destination as a pin point which is provided by a user when posting a particular job. When the pin point is selected, it can automatically be opened in the Google maps application for navigation. Google Places API has been used in the application in the show destination feature in order to autocomplete the location from google maps and to add those destination information to the database after destination details are saved on the application.



4. TESTING

4.1. Test Plan

4.1.1. Acceptance Testing

Functional testing is a much needed testing technique for any application as it ensures that the functionality in the application have been developed in accordance with the functions that have been specified. In the “Work Hub” freelancing application, acceptance testing was carried out in order to test for functionality.

Test Case ID : 001

Test Title: User Login

Test Status: Pass

Process	Expected Result	Preconditions	Input	Output
Enter Login Details	Display the home page after the user credentials have been correctly entered	Application should be launched and the login page should appear.	Username Password	Display Home page
Press the Login Button		The user should be registered		

Table 4.1.1:1 User Login

Test Case ID : 002

Test Title: User Registration

Test Status: Pass

Process	Expected Result	Preconditions	Input	Output
Enter user registration details	Redirect to the login page after registration details are saved	The user cannot be an existing user	Username Email Telephone Password Confirmation	Redirect to the login screen
Press the Register Button		The user should go to the registration page		

Table 4.1.1:2 User Registration

Test Case ID : 003

Test Title: Add Job

Test Status: Pass

Process	Expected Result	Preconditions	Input	Output
Press the Add Job Button	Save the Job details on the user profile	User should be logged in to the application	Job Name Description Location Skills Budget	Save the job details on the traveler's profile
Enter Job Details	Show the added Job on the news feed	User should be on the add Job page		Show the added Job on the news feed

Table 4.1.1:3 Add Job

Test Case ID : 004

Test Title: Update Job

Test Status: Pass

Process	Expected Result	Preconditions	Input	Output
Press the update Job button	The Updated Job details should be saved on the user's profile	There should be Job details added	Job Name Description Location Skills Budget	Updated job details should be displayed on the user's profile
Update the Job details				
Save the Job Details				

Table 4.1.1:4 Update Job

Test Case ID : 005

Test Title: Delete Job

Test Status: Pass

Process	Expected Result	Preconditions	Input	Output
Press the delete Job button	The Job should be deleted from the user's profile and the news feed	There should be job details added		Deleted job details should be disappeared from the user's profile and the news feed
Confirm delete by pressing yes				
Delete Job from the profile				

Table 4.1.1:5 Delete Job

Test Case ID : 006

Test Title: View Profile

Test Status: Pass

Process	Expected Result	Preconditions	Input	Output
Press the link to the profile on the job	The user's profile should be displayed	The user should be logged in to the system.		Show the user's profile details

Table 4.1.1:6 View Profile

Test Case ID : 007

Test Title: Review Profile

Test Status: Pass

Process	Expected Result	Preconditions	Input	Output
Write review	The written review should be posted on the user's profile	The user should be logged in to the application	Review	Show review on the user's profile
Press the submit button				

Table 4.1.1:7 Review Profile

Test Case ID : 008

Test Title: Search Job

Test Status: Pass

Process	Expected Result	Preconditions	Input	Output
Press the Search Tab	The search result according to the keyword typed.	There should be job details added		Show search results according to the matched keywords

Table 4.1.1:8 Search Job

Test Case ID : 009

Test Title: View Destination on the map

Test Status: Pass

Process	Expected Result	Preconditions	Input	Output
Go to a posted job	Redirect to the Google maps and show the destination pin point.	There should be job destination added		Display the destination of the employee on a map
Select Get Directions				
View the destination on the map				

Table 4.1.1:9 View Destination

Test Case ID : 010

Test Title: Navigate Destination via google maps

Test Status: Pass

Process	Expected Result	Preconditions	Input	Output
Go to a job	Redirect to the Google maps and show the start navigation according to the current location	There should be employees destination added		Display the destination route and expected time to reach on google maps
Select Get Directions				
View the destination on the map				
Redirect to the Google maps and show navigation				

Table 4.1.1:10 Navigate Destination

4.1.2. Non Functional Testing

Although functional testing techniques test the requirements of the application, the quality characteristics aren't tested. Non functional testing techniques should be carried out to in order to test quality characteristics such as performance, endurance, scalability, usability, etc.

Performance Testing

This testing measures the system parameters in terms of responsiveness and stability under the various workloads. Since this application is being used by the low literacy people conducting a maximum workload and of the site and testing it is essential. In performance testing this will check the speed of the application. To test the scalability of this application having a maximum number of concurrent users while system remains stable and providing a reasonable response time matters. The number of user limit should be higher than the required number of concurrent users that the application must support when it is deployed. Another goal of the performance testing is reliability. The application should always be reliable for the end user. Even though the application is used by a large number of users the application should not be crashed while working. This should be able to handle maximum number of users while it still works with a quick response.

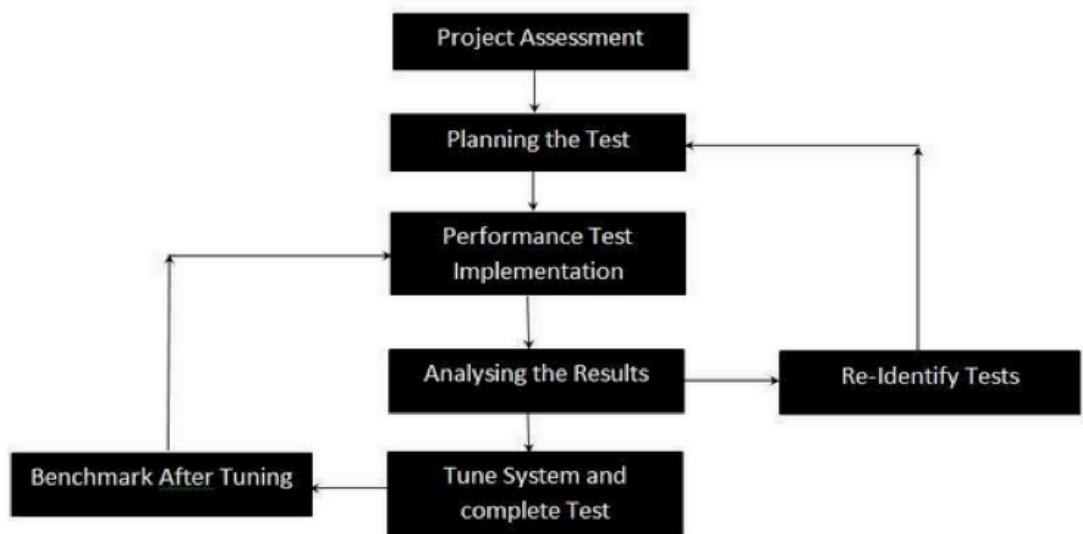


Figure 4.1.2:1 Performance testing

Usability Testing

With the use of usability testing, the developer will be able to discover potential bugs which are generally not visible to developers and which may also escape any other types of testings done. Planning the usability testing can help in fixing all the problems that a user may experience even before the system is finally released to the user which may result in better performance and standard system.

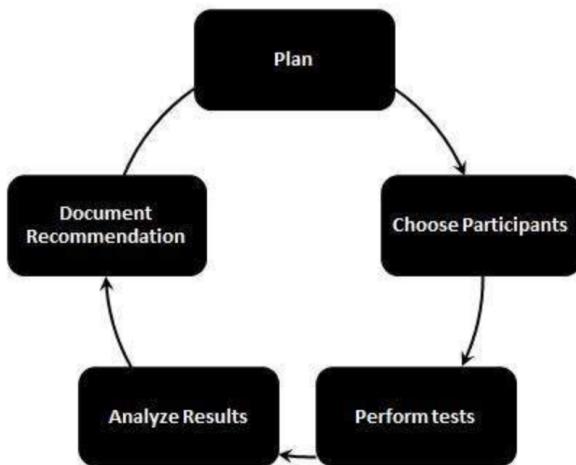


Figure 4.1.2:1 Usability Testing Process

Usability testing is an area which needs fairly a higher level of understanding with creativity. Testers who are involved in usability testing requires to have skills like patience, openness to welcome ideas, ability to listen to any suggestions given and observation skills in order to figure out the problems and fix them.

When carrying out the usability testing process, the application was given to a selected group of 10 people which includes job seekers and job providers. They were asked to use the application and to rate the application according to their satisfaction level to a questionnaire given to them.

4.2. Test Results

The following table has been created on usability testing with the feedback that was given by the participants for the questionnaire provided.

Question	Satisfaction	User friendliness	Performance	Color Scheme	Fonts	Alerts	User Interface	Run time Crashing
Strongly Satisfied	45%	20%	25%	20%	80%	70%	25%	48%
Satisfied	45%	20%	50%	65%	15%	35%	40%	36%
Undecided	5	55%	5%	15%	0%	30%	29%	16%
Dissatisfied	3%	4%	20%	0%	5%	5%	5%	0%
Strongly Dissatisfied	2%	1%	0%	0%	0%	0%	1%	0%

Table 5.2:1 Usability Test Results

Refer Appendix D for the questionnaire that was given to the group of people for usability testing.

5. EVALUATION

5.1. Critical Evaluation

During the phase of initiation and planning the main concern while planning was to plan out the functional requirements of the project to be finished within the given time frame. For this purpose, all the functions that had to be undertaken in order to develop the application were broken down into subtasks with deadlines assigned. Since the project was planned to be done as a mobile application, the required technologies and languages had to be studied and learnt before initiating the development process. This was a tough task to be completed within the given time frame.

Agile practices were followed for maintainability purposes in the whole process of development. Having the basic architecture was the main concern while developing which was easy later when adding new features. During the phase of development decisions had to be made in order to select what type of software development method had to be used in developing this project. With the limitations, a method had to be selected which would be easy to be developed. In developing the application, test driven development was the best approach to be used due the flexibility it provided while developing to meet the exact requirement within the given time constraint. As testing will be carried out in every phase in iterations, there will be no risks in errors and problems after the project has been completed. Agile method was more practical to be used than waterfall or iterative method as when using agile method, testing will be carried out after each subtask of the software has been developed. The use of agile method helped a lot while developing as development is flexible in accordance with the test results. Using a test driven development method allowed to think in advance of the other functions to be built and planned when testing is carried out within the development process. This was a major advantage for the project development.

Designing had to be done considering usability beyond the functionality. As a solution to this problem, a user centered design has been introduced while designing. Usability engineering concepts had to be applied in order to identify the user's needs for satisfaction. In order to satisfy the targeted clients according to their requirements, measures had to be taken in order to get ahead of the needs of the clients and identifying their major goals. Applying these concepts have been a success when identifying the functions and designing the user interfaces.

In the real world scenarios, reliability factor was difficult to be achieved due to the strict time constraints given for project completions. When developing the application, reliability was a major concern as failures and errors could ruin the whole process of development according to time frames. To overcome this situation to some extent, application reliability testing was performed between every iteration as agile methodology was followed during the whole process. Application of this concept helped in identifying the functional defects of the application earlier without creating a critical situation in the process of the development.

When testing was performed, the end user was always kept in the mind with a foresight of the possible scenarios the end user will possibly face. Accuracy and efficiency were therefore duly noted which assured that the end user will be able to productively operate it. Therefore testing gave a much needed assurance that the system will run smoothly without any failures after all the functions were integrated.

5.2. Future Development

After studying the results from testing and evaluation of the whole process, several features were identified that were lacking in the developed software due to the time constraint.

It would have been a more success if there were two separate kinds of account for job posters and job seekers. This feature could be implemented in the future.

Adding various filters for search could be another feature that could be developed in the future. Filtering based on a specific budget, filtering based on location or filtering based on the job title would be a great way of search for the user.

In the implemented system, payments have been not handled. For future development handling payments online via PayPal or using credit cards could be developed. This feature will be convenient for both employer and employee.

A bidding system could be also implemented for this application. Therefore employees will not be able to demand their prices according to their own wish. The employer has a chance to get the job according to the bids.

The project was carried out targeting the Sri Lankan employment community for day to day work. In the future, the same project could be expanded for the world. it could have more features taking best practices from the freelancer applications that are available at the market.

Another future work could be development of a hybrid application which would allow the users of every platform to use the application.

5.3. Project Lessons

During the development of the application, as user driven development methodologies were used, more concern had to be focused on ethical issues.

Usability testing is an area which needs fairly a higher level of understanding, skill, patience, openness to welcome any ideas given, ability to listen to any suggestions given and observation skills. Therefore measures had to be taken in order to deal with different types of people in a friendly manner.

Prior to the testing process, the selected candidates were informed well with the project that is being carried out and the nature of testing process that is going to be conducted. The testing process was only carried out after a mutual agreement with the candidates. We have also promised to protect the confidentiality of the participants of the test by not producing their identity in any form of written document produced during the project.

During the development process, new knowledge as well as new concepts were learnt. It was a great experience to use a cloud based database technology in the process of development of the application.

As analysis were done about the current unemployment problems and issues that exist for employees, a lot of knowledge was gained.

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8. APPENDICES

8.1. Appendix A - Project Specification Document

PROJECT SPECIFICATION - SEGMENT 2016/17

Student:	K.G.H.H.Kumara
Date:	15-03-2017
Supervisor:	Dr. Darshana Kasthururathne
Degree Course:	B(Eng) Hons In Software Engineering
Title of Project:	“Work Hub” Freelancing Mobile Application

Elaboration

Building an android application to help people in finding jobs and also find employees for any kind of work which a user desires.

Nowadays it's somewhat hard to find people who does day-to-day work such as plumbing, cleaning, repairing etc. Let's say some person needs to find a good TV repairer. The thing we do today is we ask around for a person who is popular and skilled in repairing electronic devices. But with the help of this application the user will be able to find the TV repairer who lives near to the users place and contact him directly through the app. The main purpose of this application is to help people in finding day-to-day work such as plumbing, cleaning etc. With the help of this application anyone can find work or workers for any line of work easily with the help of a simple user interface which anyone can understand and also some advanced features in order to help in finding better workers or jobs.

Project Aims

- Search for a specific job or worker.
- Give and get suggestions and recommendations according to the job posted or the work requested.
- Filter workers or jobs by location specified.
- Send location pins, make calls, send texts according to the needs of the user.
- Track the progress of the work through the app.
- Make employer and employee communication easy.
- Ratings and feedbacks.

Project deliverable(s)

Developing a travel planner mobile application on Android Studio using Java to run on Android

A prototype application will be delivered on an Android based mobile device.

Action Plan

Find a supervisor and agree on the project title and scope	28th February 2017
Submit agreed specification for moderation	14th March 2017
Background investigation & submission of the literature reviews after discussing with the supervisor	1st April 2017
Initial development	1st May 2017
Mid review	8th May 2017
Testing, evaluation, refinement	20th June 2017
Contemplation/ reflection	28th June 2017
Agree content page with the supervisor	1st July 2017
TurnIn submission(final)	21st August 2017
Submit bound copies	28th August 2017

8.2. Appendix B - The Ethics Form

Ethics Checklist – Project (SEGM) 55-6727

If the answer to any question is 'yes' the issue **MUST** be discussed with your project supervisor.

Question	Yes/No
1. Does the project involve human participants? This includes surveys, questionnaires, observing behaviour, testing etc.	Yes
2. Does the project involve the use of live animals?	No
3. Does the project involve an external organisation? If yes, please write the name of the organisation here:	No
4. Does the project require access to any private or otherwise sensitive material?	No
5. Does the project require the reproduction (beyond normal academic quotations) of materials authored by a source other than yourself?	No

Adherence to SHU policy & procedures

Declaration
I can confirm that: <ul style="list-style-type: none">• I have read the Sheffield Hallam University Research Ethics Policy (available at http://www.shu.ac.uk/_assets/pdf/research-ethics-policy.pdf)• I agree to abide by its principles.
Signature : 
Name : K.G.H.H. Kumara
Date : 24th March 2017

8.3. Appendix C - Questionnaire for Usability Testing

During the process of usability testing, we created a scale and asked the users to rate the system according to the satisfaction level they experienced.

1. How satisfied are you with the application?

- i. Strongly satisfied
- ii. Satisfied
- iii. Undecided
- iv. Dissatisfied
- v. Strongly Dissatisfied

2. Did you find the application user friendly?

- i. Strongly satisfied
- ii. Satisfied
- iii. Undecided
- iv. Dissatisfied
- v. Strongly Dissatisfied

3. Is the performance of the application satisfactory?

- i. Strongly satisfied
- ii. Satisfied
- iii. Undecided
- iv. Dissatisfied
- v. Strongly Dissatisfied

4. Are you satisfied with the colors used for the User Interfaces?

- i. Strongly satisfied
- ii. Satisfied
- iii. Undecided
- iv. Dissatisfied
- v. Strongly Dissatisfied

5. Are you satisfied with the font and the font size of the interface? Did u have to zoom it to see the content?
 - i. Strongly satisfied
 - ii. Satisfied
 - iii. Undecided
 - iv. Dissatisfied
 - v. Strongly Dissatisfied

6. How well are you satisfied with the Message alerts given?
 - i. Strongly satisfied
 - ii. Satisfied
 - iii. Undecided
 - iv. Dissatisfied
 - v. Strongly Dissatisfied

7. How satisfied are you with the user interfaces of the application?
 - i. Strongly satisfied
 - ii. Satisfied
 - iii. Undecided
 - iv. Dissatisfied
 - v. Strongly Dissatisfied

8. Did the application experience any crash time or down time during your usage?
 - i. Strongly satisfied
 - ii. Satisfied
 - iii. Undecided
 - iv. Dissatisfied
 - v. Strongly Dissatisfied