COMSATS University Islamabad (CUI)

<Automatic detection of Cyber Bullying in Social Media Platforms>

Version 1.0

By

Waleed Umar   **CIIT/FA18-BSE-102/ISB**

Submitted to:

Dr. Uzair Iqbal

Bachelor of Science in Software Engineering (2018-2022)

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PROJECT INTEGRATION MANAGEMENT

PROJECT CHARTER

Project Name: Automatic detection of Cyber Bullying in Social Media Platforms	**Project Number: 1**
Date: June 3, 2021	**Revision Number: 0**

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1.   Key Schedule Milestones

The key schedule milestones are as follow:

   (a) Complete documentation of project by 1st September 2021
   (b) Develop UI of the project by 1st November 2021
   (c) Develop Machine Learnings by 1st February 2022
   (d) Final Product to be completed by 24th April 2021

2.   Project Manager

Name: Dr. Tahir Mustafa Madni
Email: tahir_mustafa@comsats.edu.pk

3.   Budget Information

For our project, total of Rs50000 is allocated and more will be granted if needed. Majority of the allocated fund will be used for APIs procurement.

4.   Project Objectives

The main objective is to develop a software that can help identify cyber bullying and provide assistance to user in order to elevate their mood if they subjugated to it. The objective is to complete our project before 24th April 2022. This project is crucial for our company as it will bring in new investors.

5. Project Success Criterias

(a) The software developed meets all the criterias described in the scope document
(b) It stays within defined budget
(c) It meets the timeline set for its completion
(d) The project will be approved by the all the stakeholders involved

6. Approach

The approach to be used is as follow:
(a) Complete all documentation like SRS document, Gantt Chart and Work Breakdown Structure which points out the work to be done
(b) Perform cost analysis to point out the cost required to finish the project
(c) Pass your software through extensive testing process
(d) Clean datasets before feeding to machine learning model to remove any bias in the model

7. Roles and Responsibilities

The key stakeholders in this project are given below:

Name	Role	Position
Dr. Tahir Mustafa Madni	Project Manager	Project Supervisor
Dr. Uzair Iqbal	Assistant Project Manager	Project Co- Supervisor
Waleed Umar	Developer	Final Year Students
Aseed Ali Khokhar	Developer	Final Year Students

1. PROJECT AUTHORIZATION

Approved by:	Business Manager	Date
Approved by:	Project Manager	Date

PROJECT SCOPE MANAGEMENT ACTIVITIES

Scope Document
Project Category:

○**A**-Web Application   ○ **B** - Problem Solving and Artificial Intelligence   ○ **C**- Smartphone Application

Abstract

The project aims to analyze social media activity for a particular user. It would analyze the activities of the user on different social media platforms like Facebook, Twitter, and Instagram with the help of different machine learning models. The data collected will be passed through certain models like "Sentimental Analysis", "Emotion Detection Analysis" and "Activity Analysis".

In this age of social media, it has become very difficult to navigate these platforms due to increased cyberbullying and harassment. Our system will collect the data of the user and analyze if he/she has been exposed to some sort of harassment and the analysis report would be sent to their guardians or emergency contact that they would add during initial account setup.

Moreover, online bullying has become a major factor for mental-health related issues especially depression. This is where our system comes in handy. The chatbot analyzes user's activity to check whether the user is in good mood or not. It would prompt a message asking him/ her to talk with him. Secondly, it would recommend some activities the user did when he was in a good mood. If the mood of the system does not improve, the system would send a message to the emergency contact for the user to look out for them.

1. Introduction

Social Media has taken the world by storm. It has evolved from photo sharing platforms to a place where you can search for the latest news, find your dream job, and market your business. It has gained immense popularity among teenagers and marketers all around the globe. The usage of social media has evolved into some sort of addiction as people spend most of their time scrolling through their timelines on these platforms.
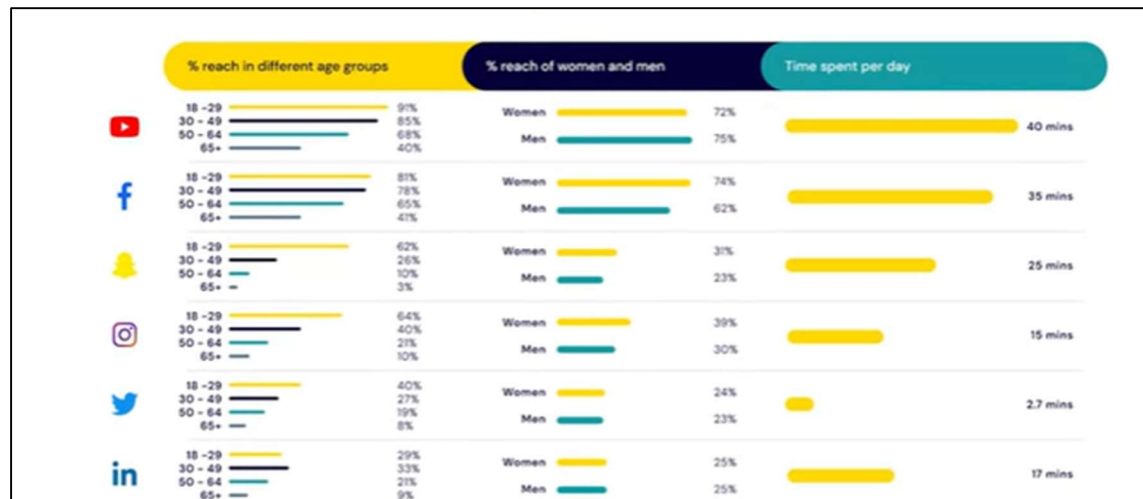
Figure 1: Usage of Social Media

But like all other things, the usage of social media has its fair share of negative aspects. The major negative impact is cyber bullying and online harassment. A study – **"No More FOMO: Limiting Social Media Decreases Loneliness and Depression"** published in the Journal of Social and Clinical Psychology suggests that there is a correlation between social media usage and mental health issues like depression, loneliness, and suicidal thoughts. Moreover, a survey conducted by State of Online Harassment in the United States concluded that 55% of people in the US consider online as a major problem. The results of the study is shown in the picture below.
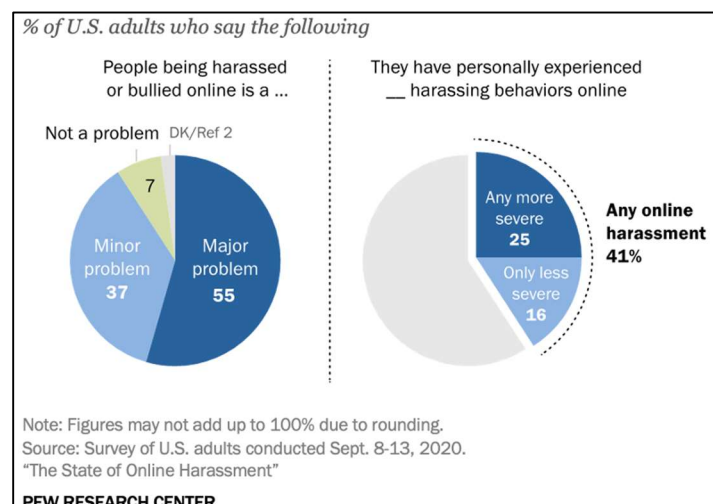
Figure 2: A study conducted in US

Keeping all these issues in mind, we will develop a project which aims to analyze social media activity for a particular user. It would analyze the activities of the user on different social media platforms like Facebook, Twitter, and Instagram with the help of different machine learning

models. The data collected will be passed through certain models like "Sentimental Analysis", "Emotion Detection Analysis" and "Activity Analysis".

As discussed above, it has become very difficult to navigate these platforms due to increased cyberbullying and harassment. Our system will collect the data of the user and analyze if he/she has been exposed to some sort of harassment and the analysis report would be sent to their guardians or emergency contact that they would add during initial account setup.

Moreover, online bullying has become a major factor for mental-health related issues especially depression. This is where our system comes in handy. The chatbot analyzes user's activity to check whether the user is in good mood or not. It would prompt a message asking him/ her to talk with him. Secondly, it would recommend some activities the user did when he was in a good mood. If the mood of the system does not improve, the system would send a message to the emergency contact for the user to look out for them. Moreover, online bullying has become a major factor for mental-health related issues especially depression and loneliness. This is where our system comes in handy. The chatbot analyzes user's activity to check whether the user is in good mood or not. It would prompt a message asking him/ her to talk with him. Secondly, it would recommend some activities the user did when he was in a good mood. If the mood of the system does not improve, the system would send a message to the emergency contact for the user to look out for them.

2. Problem Statement

As discussed above, social media has taken over the world by storm and is a source for the latest news, jobs and an important tool for brands helping them to make decisions on basis of data. But with the sudden boom in the users of social media, there has been a rise in cyberbullying and online harassment attacks which have led to depression and mental health to users. Most of these users are teenagers between the ages of 13 and 25. According to a study published in the Journal of Social and Clinical Psychology, there is a correlation between the usage of social media and mental health issues like loneliness, suicidal thoughts, and depression.

There are certain platforms, namely Social Mention, out there which provide services like our proposed system. The issue with them is that most of them offer the service of sentimental analysis. Users will have to enter a certain keyword for instance "Amazon". Another backdrop is that majority of the systems out there do not perform analysis of user's personal profiles.

This is where our proposed system is different from others. Our system will perform sentiment analysis, emotion detection analysis, and activity analysis on the social media handles of users. It will help to analyze whether our user has been subjected to bullying online and hence better understand the mood of the user with help of emotion detection analysis. It will help to detect if a user is having some suicidal thoughts or going through some difficult phase mentally. The system will have an integrated chatbot that would recommend activities to users in to improve their mood. This will be done with the help of activity analysis of the user. Moreover, the chatbot will provide the user option to talk with them to lower the feeling of loneliness.

The skills we are expecting to learn is to develop efficient models using Neural Networks and increase our skillset in Machine Learning.

3. Problem Solution for the Proposed System

The purpose of our proposed system is to provide a platform which can help user to use social media more safely, provide parents a platform where they can monitor whether their children are facing online bullying and harassment or not. In addition to this, our system will provide users with an option to search for the intent of market related to a specific keyword. Moreover, to tackle the situation of loneliness and depression detection in users, a chatbot will be implemented, which will coordinate with analyses models to detect the users' mood. If the user is feeling sad, the chatbot will suggest user activities that best suit their interests. For parents, they would receive the reports generated for the activity of their children which will help them to know if their wards are subjected to some abnormal activity on social media platforms.

All this will be implemented with the help of efficient NLP models with the help of Deep Learning and Neural Network concepts.

4. Related System Analysis/Literature Review
Table 1 provides analysis of related systems.

Table 1: Related System Analysis with Targeted Project Solution.

Application Name	Weakness	Proposed Project Solution
• Social Mention	• The UI of the website is not user friendly. • The results of sentiment analysis are shown on the sidebar.	• Design a user friendly UI which is easy to understand and navigate. • The results of the sentiment analysis will be shown prominently in the main screen along.
• Sentigem	• No option to perform sentiment analysis on a particular keyword	• Will provide user an option to check for sentiments of other people regarding a particular keyword on 3 main social media platforms namely Facebook, Instagram, and Twitter
• Tweet Sentiment Visualization	• The visualized results are very difficult for layman users to understand	• The results will be displayed in a way that would be easily understood by layman user.

		These results would be visualized in graph form.

Now coming to some common weakness in all three related systems is that they do not offer emotion detection analysis to detect the mood of the user. Moreover, they do not provide a comprehensible analysis of a particular user's timeline. Our system will be provide emotion detection analysis along with complete analysis of user's social media handles so that they can check the sentiments of others regarding them.

5. Advantages/Benefits of Proposed System

The benefits of our proposed system are as follow:

- It will provide on time assistance to people feeling depressed or sad and help them improve their mood.

- Users can check sentiment of other people regarding certain brand or keyword.

- Help parents to find out if their children are exposed to harassment and cyberbullying or not

6. Project Scope

Our project aims to help parents keep an eye on their children and to check whether they have been exposed to some sort of bullying on social media or not. Moreover, the users of social media who feel lonely and depressed will be able to get on time assistance in order to help them suppress these negative thoughts. For people interested in marketing their products, they would be able to look out for the sentiment of users regarding their product, their brand or their company hence enabling them to make data driven decisions,

The software solution will provide a platform where users can connect their social media handles with the system. The system will then perform different analyses on social media handles and will generate a single report which will comprise of different metrics like how many of the mentions on their profile were good and how many were bad. The generated report will be sent to their parents or guardians via email.

The system will keep track of user's activity along with their mood. This will help to generate recommendations for users when they feel sad or lonely. All recommendations will be provided with the help of an integrated chatbot which will provide an option to the user to indulge in talk with him.

Our proposed system will be mobile and web-based application for the users.

7. Modules

Module 1: User Account Management System (Parents and Kids)

Features:

- In this module, features regarding account creation and login will be handled
- New users can easily register for our system by filling in the sign up form
- Users will be given option to change their name and password
- Users will have an option to delete their accounts.

Module 2: Admin Privilege System

Features:

- Admin can view the list of registered users
- Admin can add or remove users
- Admin can send notifications to the users

Module 3: Data Scrapping

Features:

- This module deals with data scrapping to perform different functions
- Scrapping of data from Facebook
- Scrapping of data from Instagram
- Scrapping of data from Twitter

Module 4: Sentiment Analysis

Features:

- In this module, the sentiment analysis model will be implemented to check sentiment of user's activity on different social media platforms.
- The model analyzes the text and classify the text in three categories which are "Good", "Bad" and "Neutral"
- In this module emotional analysis is also implemented which checks for the emotions of the user based on their social media activity.
- A report will be generated based on these analysis and will be delivered to the guardians or emergency contacts of the user.

Module 5: Activity Analysis

Features:

- This module will be used to track and record activities of the user.
- User will be able to record their activities and their moods.
- On base of the entered data, the system will recommend related activities to the user on the basis of his current mood.

Module 6: Virtual Assistant Chatbot
Features:
- In this module a chatbot will be implemented
- The chatbot will analyze the behavior and mood of the user on basis of different analyses as discussed above.
- On basis of mood of the user, the chatbot will provide recommendation to the user along with an option to have a chat.

Module 7: Data Visualization
Features:
- In this module, the results of sentiment analysis will be visualized to user in form of bar charts and graphs on weekly basis
- In this module, the results of emotional analysis will be visualized to user in form of bar charts and graphs on weekly basis

Module 8: Development of Mobile Application
In this module, we will make the mobile application of our project.

Module 9: Development of Website
In this module, we will develop a website for our proposed system. The website will be built on principles of Human Computer Interaction and would be responsive

8. System Limitations/Constraints
Following are some of the limitations and constraints:

1 - The system will require active internet connection to visualize results based on the analysis' performed.

2 - The system mobile application would require Android Version 5.0 or higher

3 - The system mobile application would require IOS Version 11 or higher

4 - The system mobile application will run on devices with RAM 2GB or above.

5 - Graph API has a limit of 200 calls per user per hour

9. Software Process and Design Methodology
The software methodology used in this project will be **Agile**. The reason to use this model is to ensure that the project finishes on time. Moreover, this method will help to adapt to changes more quickly and efficiently. Another factor that forced us to select Agile is that the work is divided into small iterations with a limited time that can exist as a separate work product. Since the work is divided into small chunks, the quality of work will be improved as it would be easy to

test and validate the system. The quality of the product is an important factor for us as we have to make our product as efficient as possible to generate accurate results.

We will be using an object oriented approach for our project. The rationale behind this decision is to reduce code redundancy as the categories described in modules will be used again and again. So this would help in code reusability. For instance, in order to recommend activities to the user, the system needs to use a sentiment analysis model to analyze the sentiment of the user and then recommend activities accordingly.

10. Tools and Technologies

Table 2: Tools and Technologies for the Targeted Project.

	Tools	Version	Rationale
Tools And Technologies	MS Visual Studio	2019	IDE
	MongoDB	2015	DBMS
	MS Word	2013	Documentation
	MS Power Point	2013	Presentation
	Figma	-	Mockups Creation
	Android Studio	4.1.2	IDE
	Pycharm Professional	2021.2	IDE
	MS Project	2013	Documentation
	Technology	**Version**	**Rationale**
	Python	3.7	Programming language
	MQL	2013	Query Language
	Flutter	1.22.5	UI Development
	Dart	2.10.4	Programming Language
	Tensor flow	2.4.1	For developing ML models

11. Project Stakeholders and Roles

Our project will be sponsored by Comsats University Islamabad. The main stakeholders involved are Waleed Umar and Aseed Ali Khokhar along with our project supervisor, Dr. Tahir Mustafa Madni.

Table 3: Project Stakeholders for the Targeted Project.

Project Sponsor	COMSATS University Islamabad
Stakeholder	- Group Member: Waleed Umar (FA18-BSE-102) - Group Member: Aseed Ali Khokhar (FA18-BSE-015) - Project Supervisor Name: Dr. Tahir Mustafa Madni - Co- Supervisor Name: Dr. Uzair Iqbal - Final Year Project Committee: Evaluation of the Project

12. Team Members Individual Tasks/Work Division

Table 4: Team Member Work Division the Targeted Project.

Student Name	Student Registration Number	Responsibility/ Modules
Waleed Umar	• FA18-BSE-102	**Modules:** 1,2,4,9 **Name:** User Account Management System (Parents and Kids), Admin Privilege System, Sentiment Analysis, Development of Website
Aseed Ali Khokhar	• FA18-BSE-015	**Modules:** 3,5,6,7,8 **Name:** Data scrapping, Activity analysis, Virtual Assistant Chatbot, Data Visualization, Development of Mobile Application

13. Data Gathering Approach

The major part of our data is gathered from the internet. The techniques used were Ethnography and Interviews. We visited certain forums and blogs and observed grievances of people and what they require or their primary requirements for systems related to our projects. Moreover, we conducted interviews with users on Twitter indulging in talks in DM's and asking questions in the comment section.

14.Concepts

Concept-1: Data Visualization:

In our system we would show the results of different analyses models in form of graphs and charts to the user. So we will learn about different visualization tools and libraries like Plotly and Seaborn.

Concept-2: Data Analytics:

Since we will be visualizing our data, it is important to analyze and clean our data to display only the required results. So it is another important concept that we will be learning in our project.

Concept-3: Neural Networks:

Neural networks will be used to make our proposed analyses models like Sentiment and Emotional Analysis models along with playing a crucial role in development of chatbot.

Concept-4: Non-Relational Databases:

The database that we will be using to store data will be Non-Relational Database and the best Non-Relational Database for this purpose is MongoDB. Hence it is important to learn MongoDB and its working.

Concept-5: API Call:

API call is an important concept that will be used very much in our project. The rationale is that we would be using Facebook, Instagram and Twitter API's to retrieve data and perform different actions on it.

Concept-6: Responsive web and mobile UI designing:

Since our project is web and mobile based, it is important to make a responsive UI design so that it can be accessible on devices of different screen sizes.

15. Gantt chart
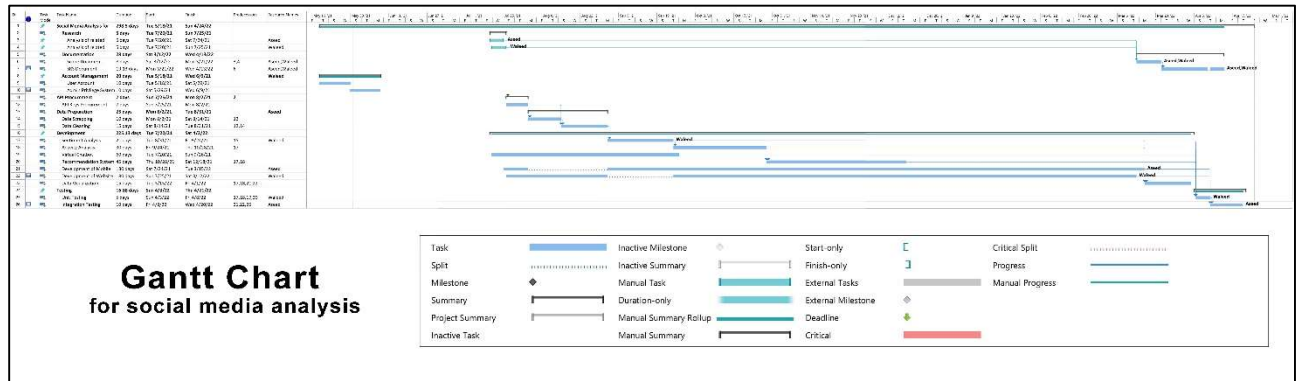
Figure 3: Project Gantt chart

16. Mockups

Figure 4: Mockup for search query display

17. Conclusion

This main objective of writing this document is to provide an overview of our proposed system by pointing out modules and defining the purpose for the project. The proposed system will provide a mechanism for users to check whether they are subjugated to online harassment. The parents will have a platform to keep an eye on their children without violating the right of privacy of the child as they would only be given a report showing the metrics of the analyses performed.

18. References

1. Melissa G.Hunt, Rachel Marx, Courtney Lipson and Jordyn Young, (2018), No More FOMO: Limiting Social Media Decreases Loneliness and Depression, Journal of Social and Clinical Psychology (**Journal paper example**)

2. 58% young females on social media have faced harassment, abuse, https://www.business-standard.com/article/current-affairs/58-young-females-on-social-media-have-faced-harassment-abuse-survey-120100600667_1.html, 5/17/2021 (**Website reference for figure 2**)

3. Facebook Social Media Marketing Professional Certificate, Course 1 – Introduction to Social Media Marketing (**Course reference for Figure 1**)

Work Breakdown Structure

The Work break down structure corresponds to Project Scope Management Knowledge area
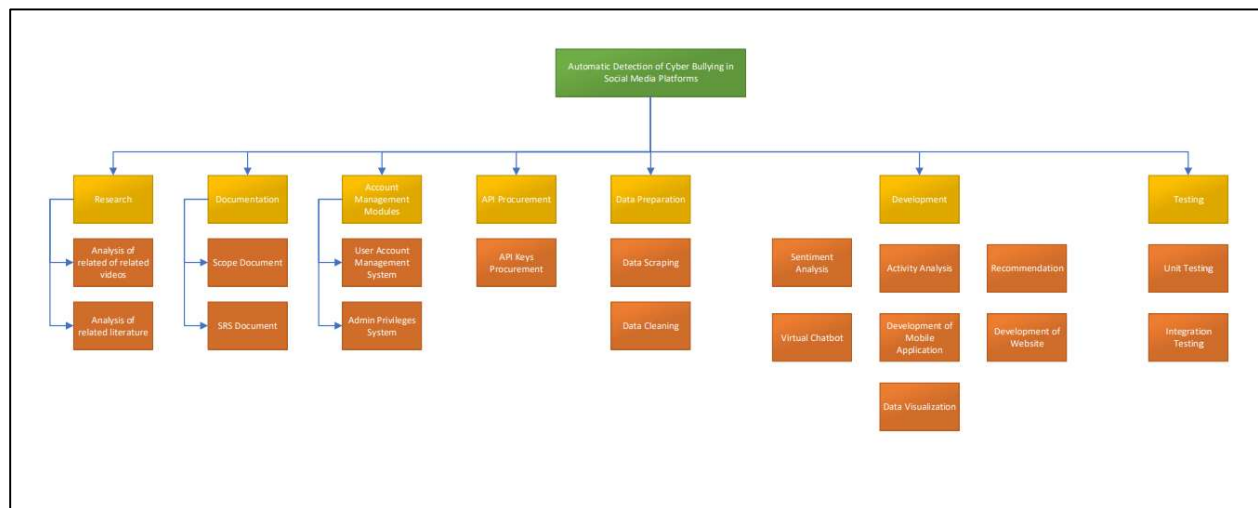
Figure 5: Hierarchical Implementation of WBS

PROJECT TIME MANAGEMENT ACTIVITIES

Gantt Chart

Zoom in the picture to get clearer view, the image quality will not be distorted
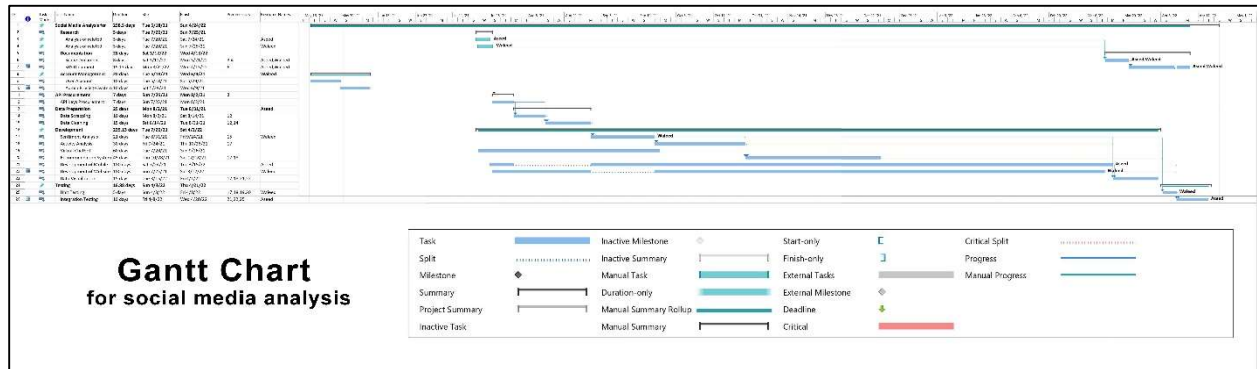
Figure 6: Gantt Chart

Network Diagram and Early Start, Early Finish, Late Start and Late Finish
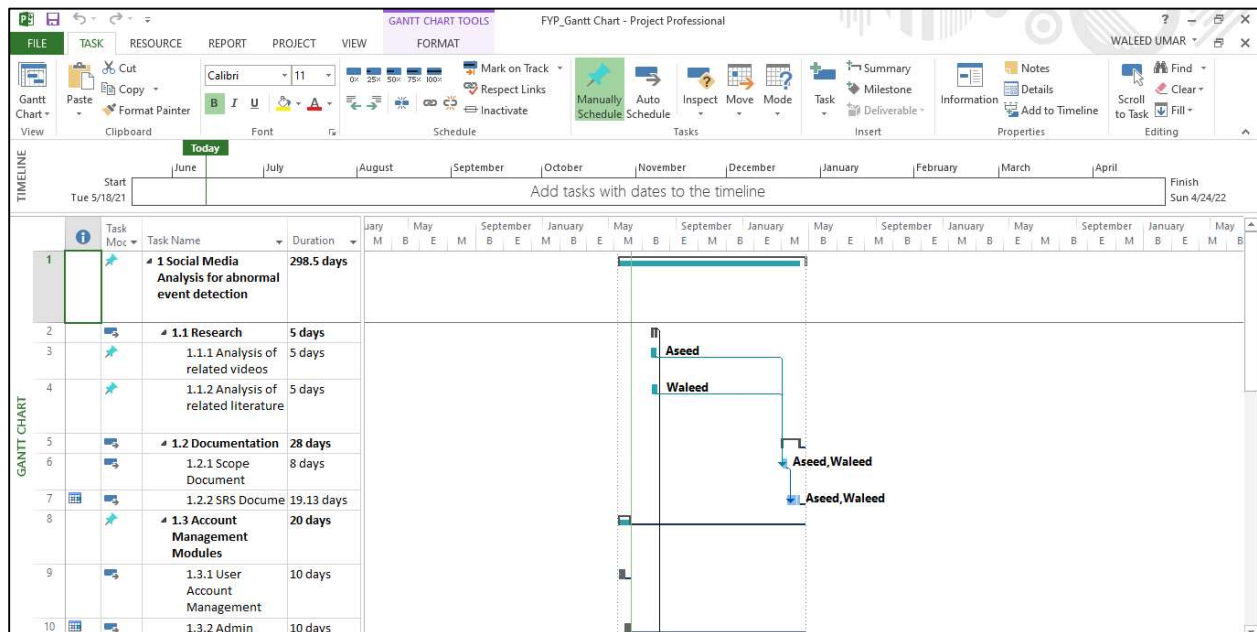
Figure 7: Insert Tasks and Duration
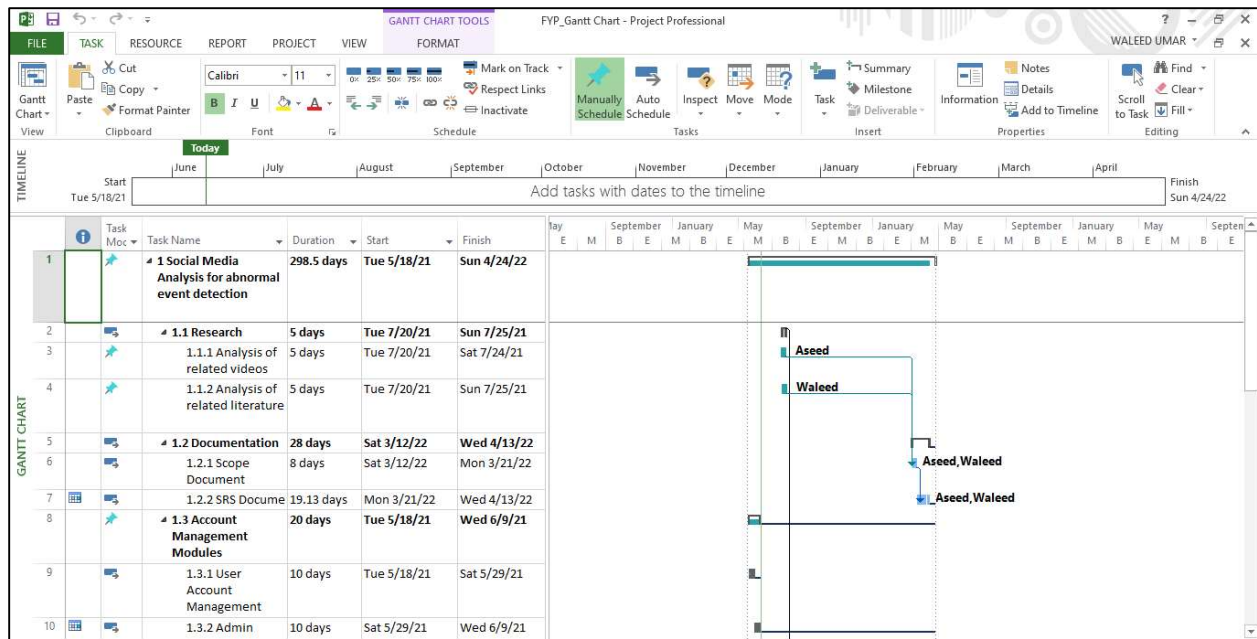
Figure 8: Adding start and finish date
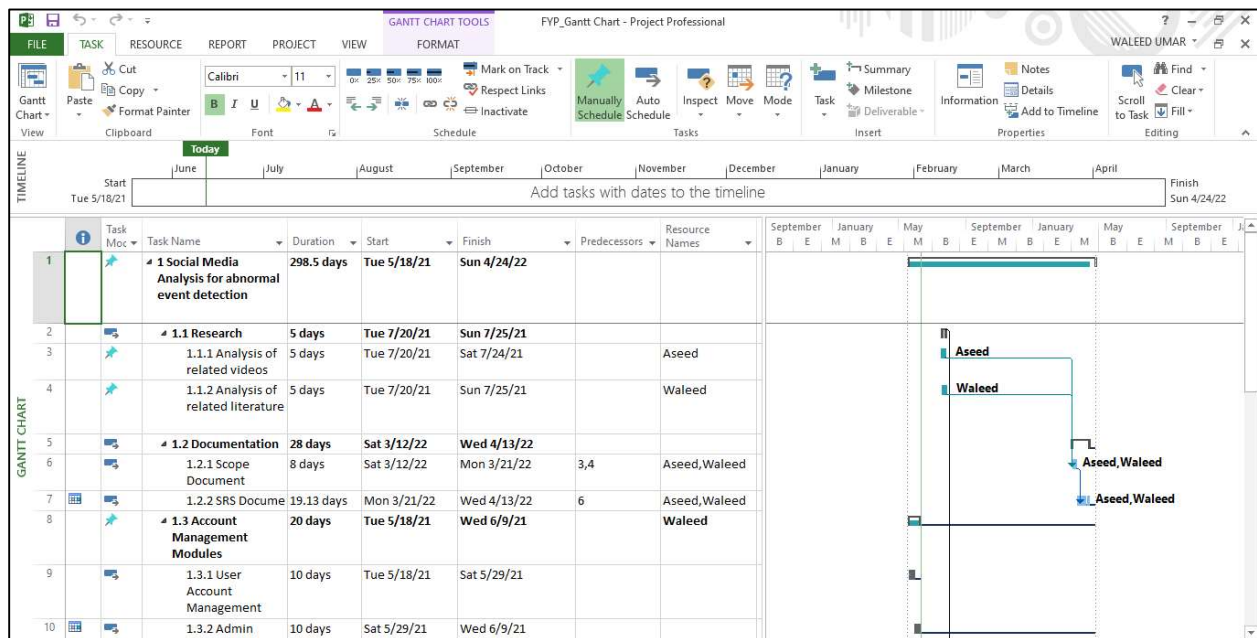
Figure 9: Assigning Predecessors and Resources
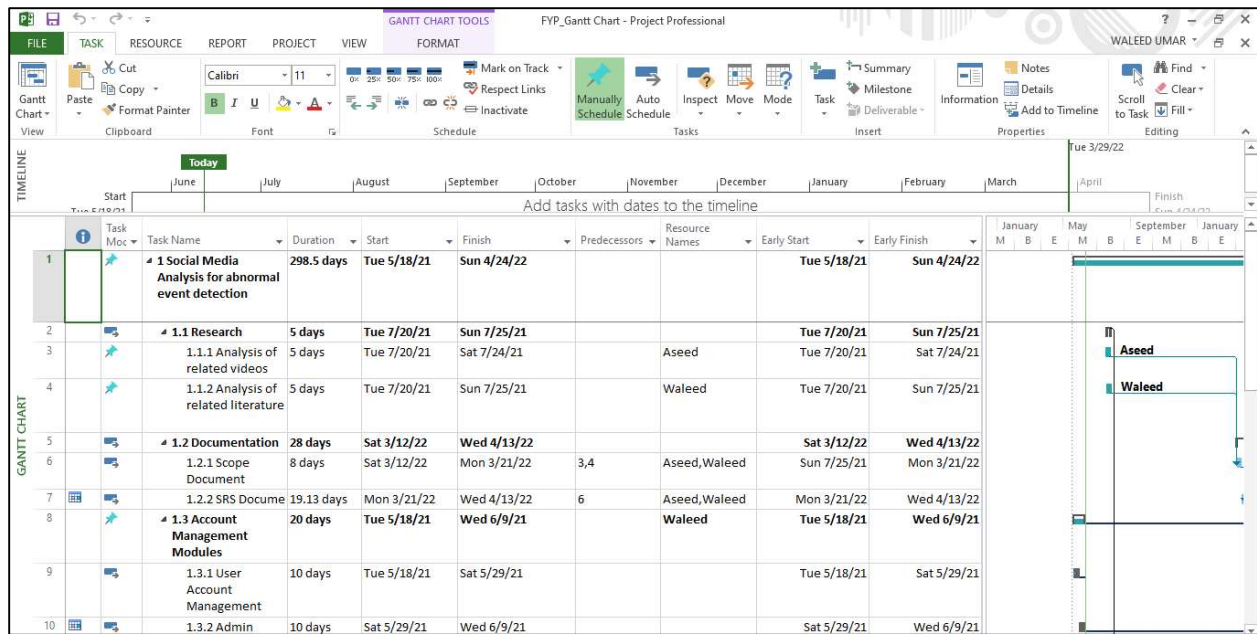
Figure 10: Assigning Early Start and Early Finish
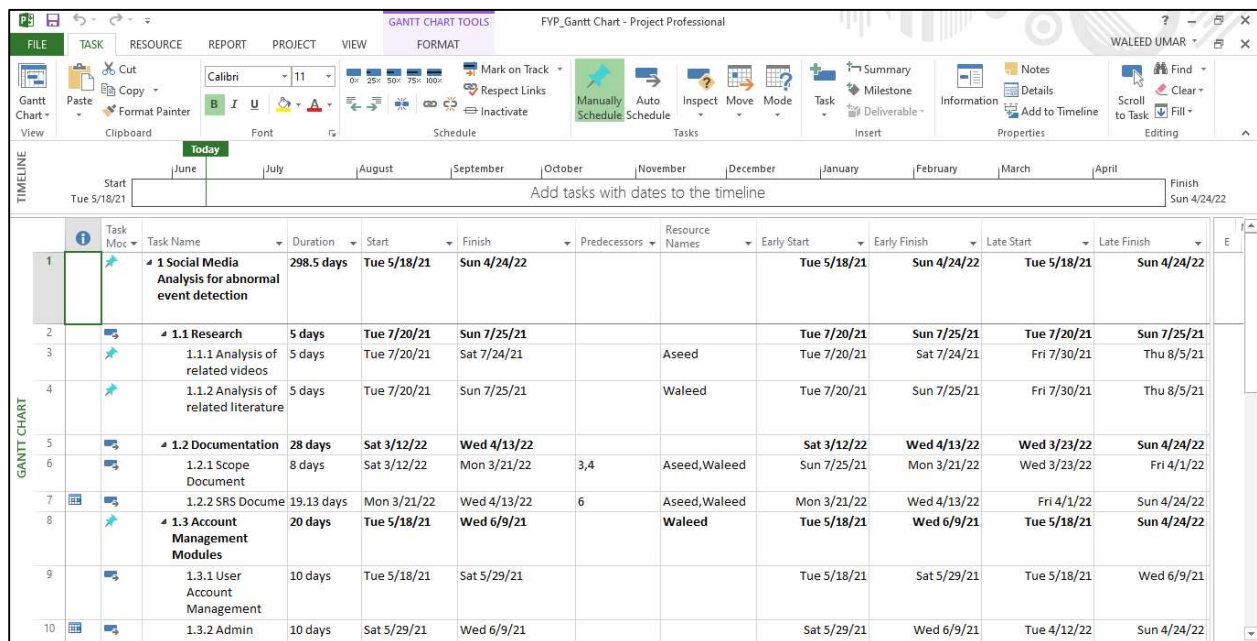
Figure 11: Assigning Late Start and Late Finish
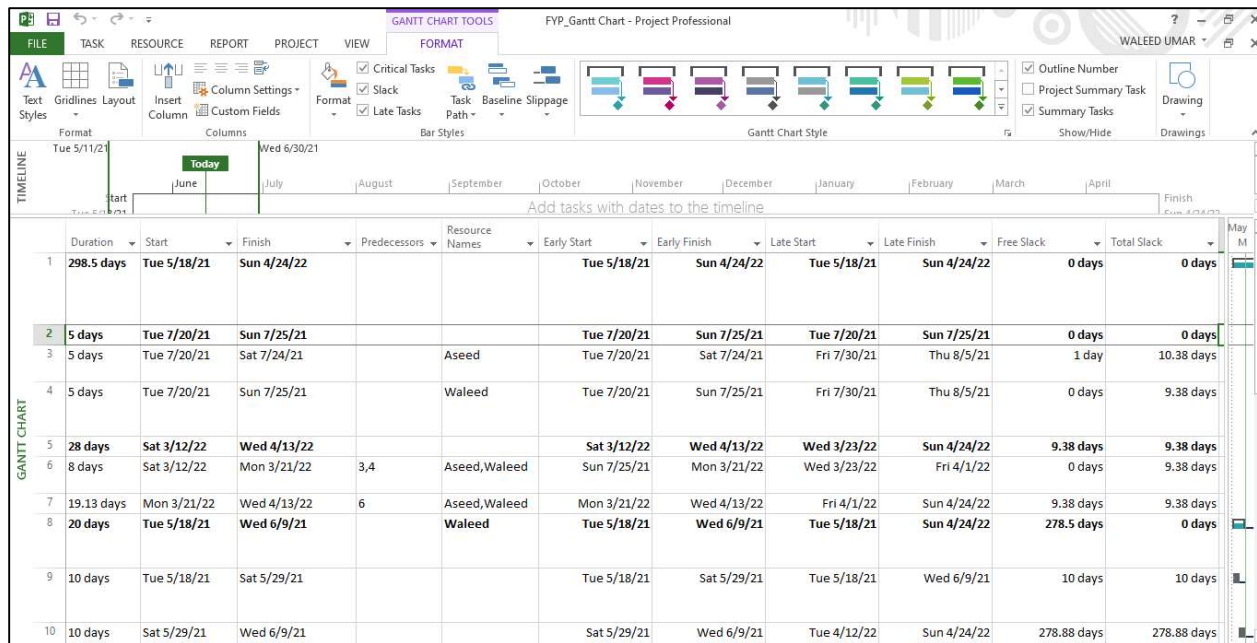
Figure 12: Finding Free Slack and Total Slck
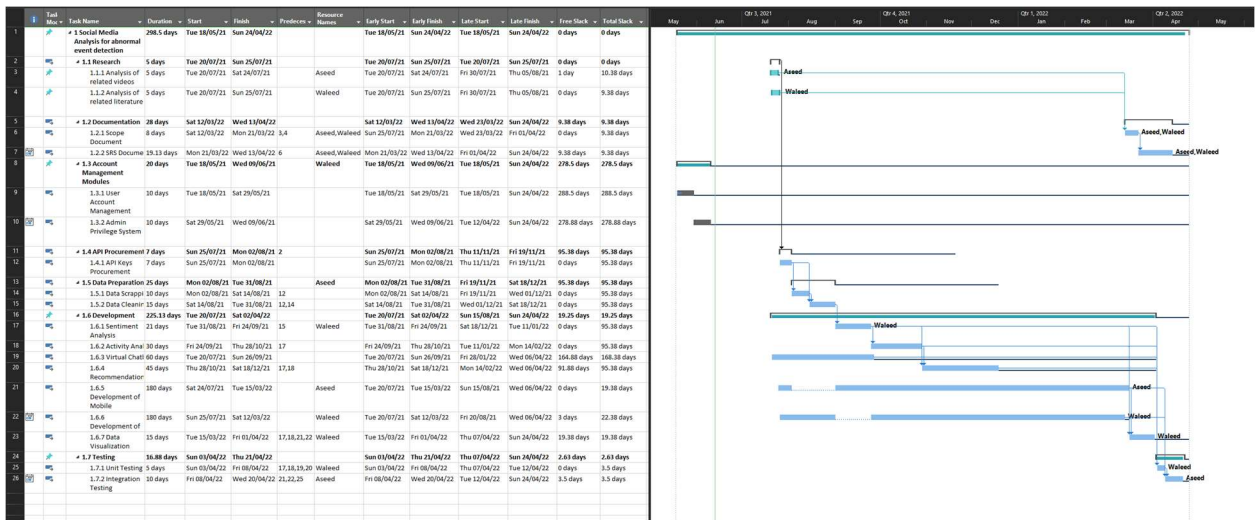
Figure 13: Collective Image of All Tasks
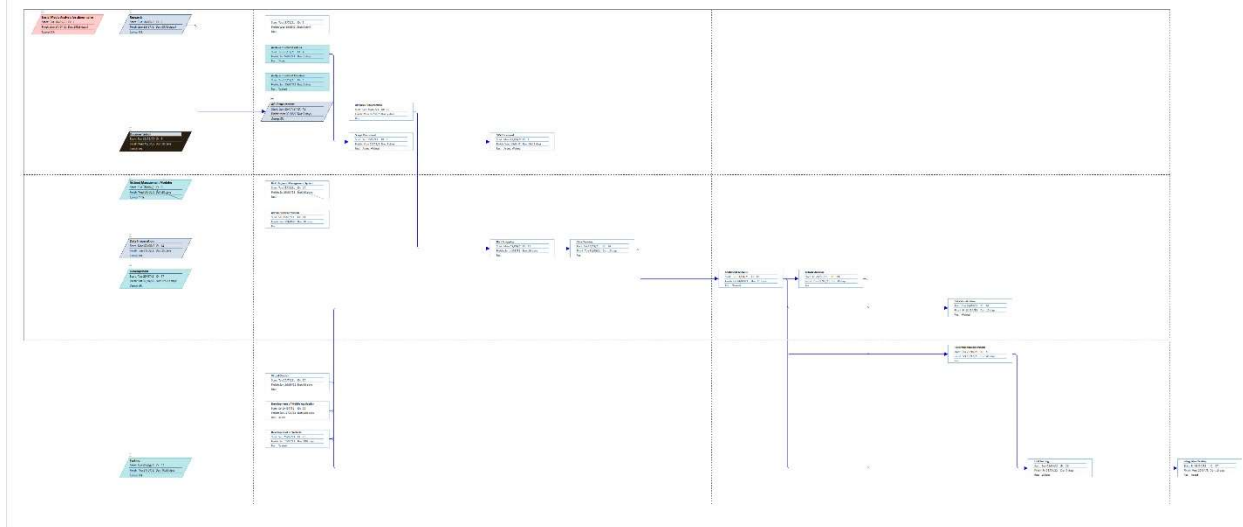
Figure 14: Network Diagram of the Project

Note: Kindly Zoom In Figure 8. The image quality will not be distorted.

Some important terms and their definitions:

1. **Slack / Float:** It is the amount of time a particular activity is delayed without causing an effect on the overall project finish date.
2. **Critical Path:** The longest path to finish the project is called critical path.
3. **Free Slack / Free Float:** It is the amount of time an activity can be delayed without delaying the early date of an activity which follows the current activity immediately.
4. **Early Start:** It is the earliest time an activity can start in the project.
5. **Early Finish:** The earliest time an activity can finish
6. **Buffer:** The additional time added to relax the project time constraint

Resource Breakdown Structure
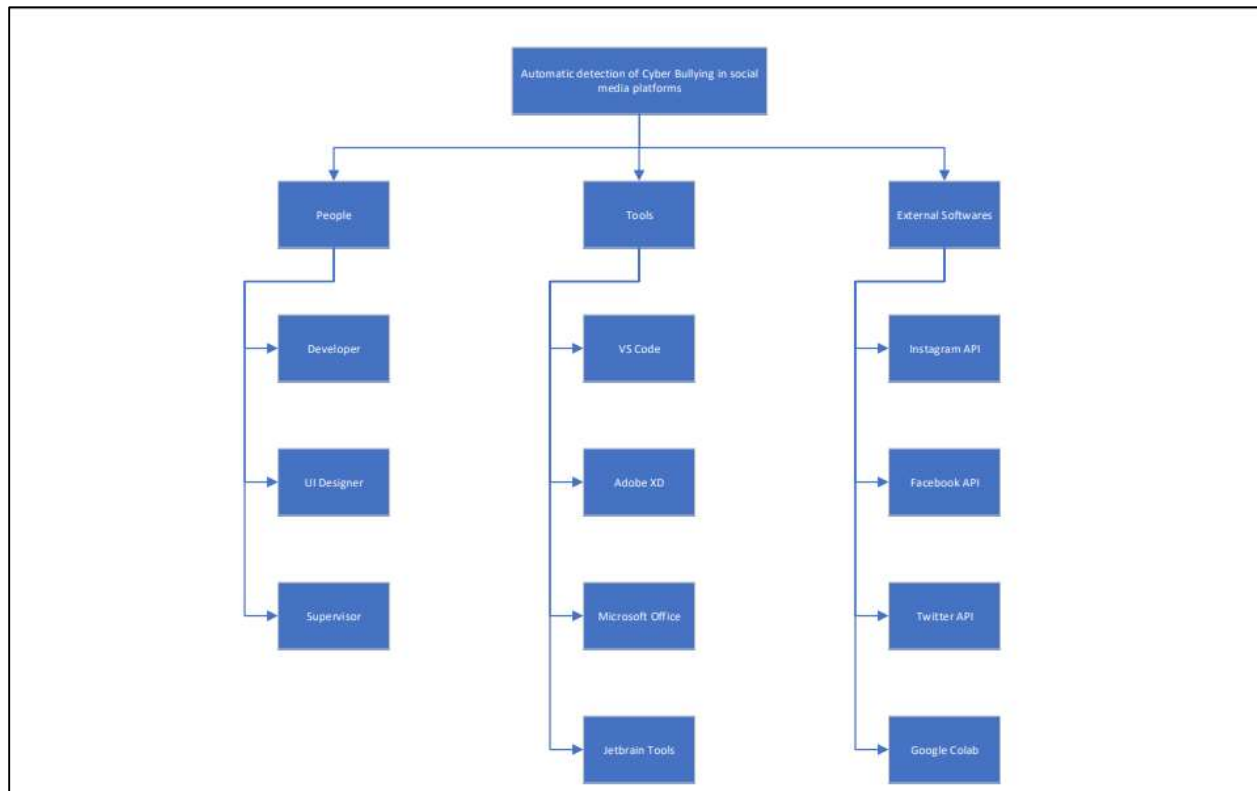
Figure 15: Resource Breakdown Structure

PERT Evaluation

The time it takes to complete **documentation** for project is 28 days.
The **optimistic** time is 20 days
The **pessimistic** time is 35 days

Formula for PERT EVALUATION:
Optimistic time + 4*(most likely time) + pessimistic time/6

Plugging the values in the formula, the answer we get is:
20+ 4*(28) + 35/6 = 27.8 days

The time it takes to complete **Data Preparation** for project is 25 days.
The **optimistic** time is 20 days
The **pessimistic** time is 30 days

Formula for PERT EVALUATION:
Optimistic time + 4*(most likely time) + pessimistic time/6

Plugging the values in the formula, the answer we get is:
20+ 4*(25) + 30/6 = 25 days

HUMAN RESOURCE MANAGEMENT ACTIVITIES

Introduction

Human Resource Plan is an important part of any project as it enables you to have a look on your human resource and optimize the task division for better and timely results. The plan will include following tasks:

1. Division of Roles and Responsibilities
2. Skills required
3. Reporting Relationships
4. Organizational Chart

The purpose of this document is to clearly define the type of human resource required and the skills the acquired personnel should have in order to effectively work on this project.

Roles and Responsibilities

For better results, it is important that all the stakeholders involved must know their roles and responsibilities before working on the project so that they know what is expected of them. For this to happen, it is important that each and every member should be assigned their roles and responsibilities. They should know what skill they require to carry out the task

Project Supervisor:
Project Supervisor ensures the success of the project. He works as an intermediary between the top management and the team working on the project. His role is to guide the team to achieve the output and provide an end product covering all the features defined in the scope document and finishing in time. Moreover, he ensures that the groups working should be provided with the required assistance and resources.

Development Team:
The development team will work on the project. They will ensure that the project is completed on time and has all the features as prescribed in the scope document. They should follow the coding criteria defined for the project (Object Oriented Programming). Moreover, since the defined project is Machine Learning based so they should have proficient knowledge in this field. They need to follow certain coding criterias.

Business Analyst:

The responsibility of Business Analyst is to gather requirement from the stakeholders and document them. He should be able to clearly define function, non-functional and business requirements for the project. He should be able to know which technique suits best along with the reason why he thinks it is the best technique. The main reason is that the development team will work according to the data given by Business Analyst.

Software Tester:

After the requirements are coded, the duty of software testers arise. They would make sure that the software developed by the development is fit for the job. They have to perform automated tests to make sure that so that they make sure that the product is risk free and free of bugs.

The roles and responsibilities can further be represented with the help of **RACI** Charts.

The word RACI stands for:

1. **Responsibility:** Who does the work
2. **Accountability:** Who signs off the task
3. **Consultation:** Who has necessary information to carry out the task or to whom we can consult when we are having confusion
4. **Informed:** Who needs to be informed

Table 1: RACI Chart

	Waleed	**Aseed**	**Dr. Tahir Madni**	**Dr. Uzair Iqbal**
Scope Document	R	I	A	C, I
SRS Document	R	R	A, C	A, C
Data Preparation	I, C	R	A	I
Sentiment Analysis Model	I	R	A,C	I
Chatbot	R	C, I	A	A, C
Activity Analysis	I, C	R	A, C	I
Recommendation System	R	I, C	A, C	I, C

Development of Mobile App	**R**	**R**	**A**	**A, I**
Unit Testing	**R**	**I**	**A**	**C, A**
Integration Testing	**I**	**R**	**A, I**	**C, A**

Organizational Chart
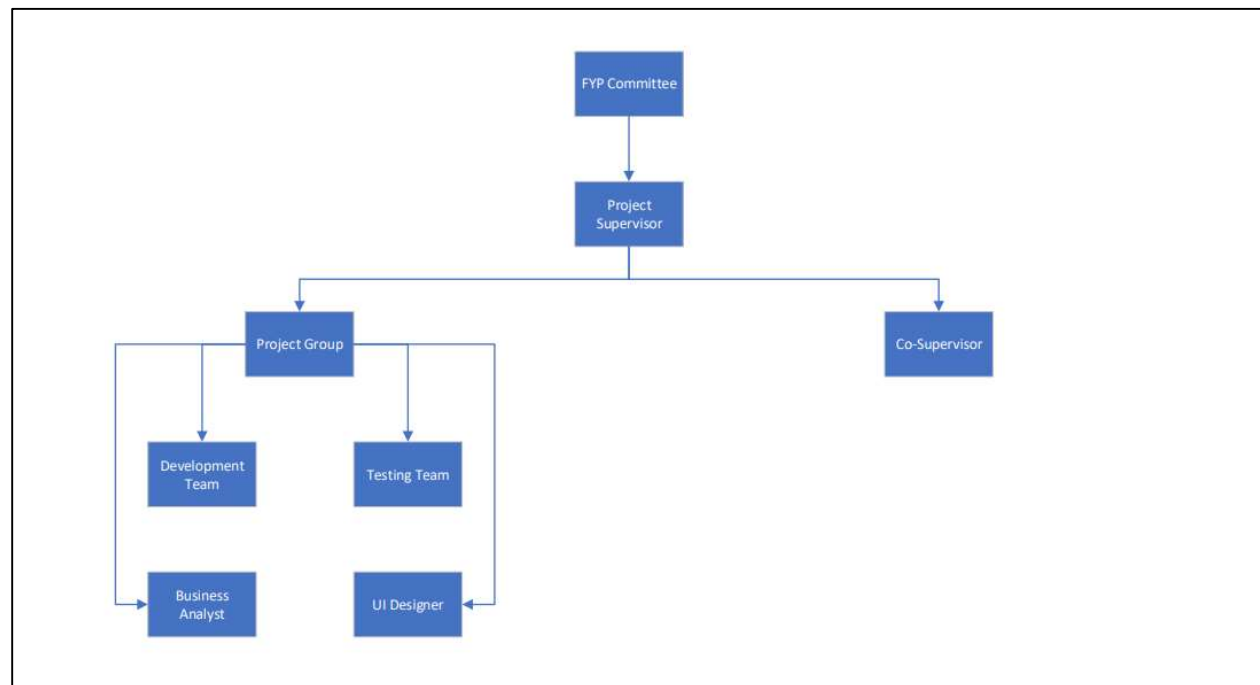
Figure 16: Organizational Chart for our projec

PROJECT QUALITY MANAGEMENT ACTIVITIES

The activities covered are:

- Software Quality Assurance Plan

- Software Development Plan

SOFTWARE DEVELOPMENT PLAN
Project Products:

NO	Deliverable	Type	Date
1	Proposal	Hard + Soft Copy	30th May 2021
2	Software Requirement Specification	Hard + Soft Copy	1st September 2021
3	Software Design Document	Hard + Soft Copy	6th October 2021
4	Progress Report	Hard + Soft Copy	Every week
5	Testing Report	Hard + Soft Copy	After every integration cycle
6	Prototypes	Soft Copy	20th July 2021
7	Software Product	Cloud + App source code	25th April 2022

Interfaces
The interfaces for our system are as follow:

- The software will interact with the databases to store data
- The software will interact with Twitter API to access its records to perform analysis
- The software will use browser interface to show the data to the user
- The software will interact with Facebook API to export chat and perform analysis

Project Development Tools and Methodology

The software methodology used in this project will be **Agile**. The reason to use this model is to ensure that the project finishes on time. Moreover, this method will help to adapt to changes more quickly and efficiently. Another factor that forced us to select Agile is that the work is divided into small iterations with a limited time that can exist as a separate work product. Since the work is divided into small chunks, the quality of work will be improved as it would be easy to test and validate the system. The quality of the product is an important factor for us as we have to make our product as efficient as possible to generate accurate results.

We will be using an object oriented approach for our project. The rationale behind this decision is to reduce code redundancy as the categories described in modules will be used again and again. So this would help in code reusability. For instance, in order to recommend activities to the user, the system needs to use a sentiment analysis model to analyze the sentiment of the user and then recommend activities accordingly.

The tools used for the developing our project are as follow:

- Tensor flow
- Dart
- Flutter
- Adobe Xd
- Python
- Twitter API
- Facebook Graph API
- Jupyter Notebook
- Instagram API
- MongoDB

The testing methodologies used are as follow:

- Unit Testing
- Integration Testing
- Business Functional Testing
- Browser Compatibility Testing

Standards and Procedures

The project will follow no certain standard nor follow any formal procedures. The developers can work as they see fit. Necessary guidelines to follow will be provided to maintain certain type of order for smooth building of the software. The project manager can use any technique he deems fit to evaluate certain artifacts or modules to gain 100% result.

For instance he can use walkthrough procedure to give a review to the documents involved in the project.

Map of Development Process

Gantt Chart
for social media analysis
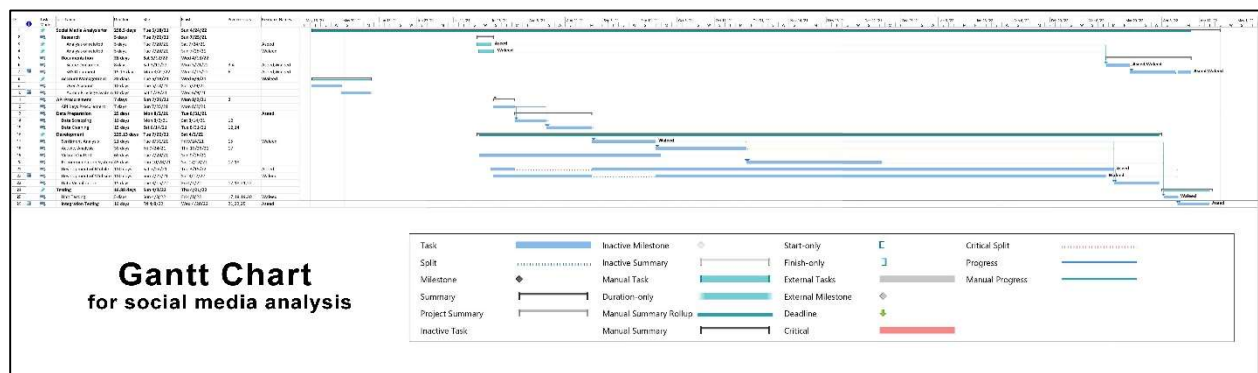
Project Staff Organization

Following are some requirements needed to make a team to make the project successful:

- A total of 6 members needed
- Web designer with minimum of 2 years of experience
- JavaScript developer with React Native knowledge. Min of 3 years of experience needed
- UI/ UX developer with 6 months of experience needed.
- Flutter developer with 2+ years of experience
- Business Analyst
- Data Science experts who have experience in data analysis and machine learning

Development Risks and Risk Management Actions

Following are two common type of risks involved:

- The person applying may have the experience required for the job but lack skills. In order to manage this problem, provide a small task similar to that of the project and analyses their skills.

- There is a high risk of losing money on the project. You may face cost overruns
- There is a risk that the project may not finish on time

Milestones

S No	Milestone	Completion Time	Project Products
1	SRS	3 weeks	Document
2	UI Design Mockups	5 days	Prototype
3	API Procurement and Authentication	7 days	-
4	Sentiment Analysis Model	3.5 weeks	Interface
5	Software Design Model	3 days	Document
6	Integration Testing	-	Document
7	Project Completed	3 months	Software

SOFTWARE QUALITY ASSURANCE PLAN

Purpose

The purpose of this Software Quality Assurance (SQA) Plan is to establish the quality goals, tools and methodologies required for the project, and list of reviews along with testing required to implement effective quality assurance functions for the **<Automatic detection of Cyber Bullying in Social Media Platforms>** project. The Software Quality Assurance plan provides guidelines to ensure that the product is developed in confront to the requirements, it is carried out on time and is free of errors

1. Quality Goals

The quality goals for the given project are listed below:

QUALITY GOAL	DESCRIPTION
Usability	The system is easy to use for the new users
Reliable	The system should be able to analyze the content correctly
Performance	The system should be able to fulfill request of multiple users at a time.
Security	The system shall be secure and stop unauthorized user from using the services

2. List of Reviews

Software Requirement Review

After the requirements are gathered from the stakeholders, a meeting will be held to discuss these requirement. In this meeting, all the stakeholders will gather. After everyone is gathered, all the requirements extracted from the stakeholders will be read line by line, page by page to ensure that that the document contains all the requirements of the stakeholders that they want to implement in the system.

Managerial Review

In this review, all the progress done is reviewed. It is done to keep a track on the work status of the product. For Sentiment Analysis Application, the managerial review will be held twice a week to look at the status of the work and discuss if the teams working on the project require any other resources to carry out their task.

Technical Reviews

Technical review is done by a group of specialized personnel to check if the system being developed is on the lines of the requirements gathered and discussed in software requirement review.

It is done to check if the system is in align with its intended purpose and to find out defects early in the process as it would be easy and less costly to tackle them. For our system, technical reviews will be done after completion of each module and after integration of certain modules in order to detect the errors.

After integration of subsystems, a group of senior developers will conduct technical reviews to find out if the system is working properly or does it need some overhauling

Post Mortem Review

Post mortem review will be done at the end of the project. In this review, all the things are written from what went good and what were the failures that the team experienced while working on the project.

All this is done to document the failure which were encountered so that these risks and failures can be controlled in the future.

3. Testing

Testing is done to ensure that the system is free of errors. The purpose is to find bugs and errors in the system so that they can be handled before the system is deployed in real world environment.

Following are certain tests that needs to be done in order to ensure that the product is free from errors and faults.

Unit Testing

Unit testing is done to validate the smallest testable part of the software (known as unit) along with the testing of logic and data flow involved and the observable behavior of the system.

Unit testing is done to check that the selected unit is working as intended.

Integration Testing

In integration testing, we integrate different units and subsystems and see if that they work together in the intended manner. It is done to see that the components coexist and work in an error free environment.

This testing ensures the application components work together prior to Business Functional Testing.

Business Functional Testing
It is done to ensure that the product developed meets all the specified requirements as gathered and written in Software Requirement Specification document.

Browser compatibility testing
The browser compatibility testing will be done after completion of each module to see if it is working properly on all the browsers as intended. It will also be done after the integration of modules to again check for the working and find out any faults.

4. Problem reporting and corrective actions
The Project Supervisor is responsible for taking action to resolve issues and solve problems identified by the project team. Issues will come from reviews of delivered documentation, the build process, installations, testing and/or usability reviews.

The Project Supervisor then may solve issues themselves or assign them to any individual or team to reach its solution.

5. Tools, Methodologies and Techniques
The following section describes the tools, techniques and methodologies used to carry out the SQA plan:

Tools:
The tools used are as follow:

1. Defects and change request will be handled through bug tracking software like JIRA (used for tracking defects) and change requests will be handled through MS Word.
2. Project Schedules will be handled through JIRA
3. Minutes of Meetings will be recorded in MS WORD

Methodologies:
The methodologies used to carry out our tasks are as follow:

1. Project Schedule will be updated on weekly basis to ensure that everyone knows the status of the work done. It will help teams to work accordingly and deliver project on time
2. Source code of each unit will undergo peer view to make sure that it follows the standards.
3. Source code will be tested before it is released for real world environment

Techniques:

1. In reviewing documents, a combination of reviews and walkthrough of the whole document will be conducted. Prior to submission of document related artifacts for approval, the writer of these documents are required to evaluate them against corresponding guidelines and associated checklists.
2. Functional requirement documents will require both Technical and Functional Reviews. Execution of these reviews will be recorded.

PROJECT COMMUNICATION MANAGEMENT ACTIVITIES

The activity covered is **Project Communication Management Plan.**

COMMUNICATIONS MANAGEMENT PLAN						
ID	STAKEHOLDER	INFORMATION	METHOD	TIMING OR FREQUENCY	ASSUMPTIONS	CONSTRAINTS
S001	Dr. Tahir Madni	High level information like implementation of module or addition of new feature	Email, Whatsapp and verbal updates via team leads.	Every 2 weeks	The email sent will not go into Spam or Junk folder	Email can be combination of plain text or word file. Max attachment size to be 25mb
S002	Dr. Uzair Iqbal	Tech spec and hardware requirements. Go live dates and pen test results.	Email, Whatsapp and verbal updates via team leads.	Every 2 weeks	The email sent will not go into Spam or Junk folder	Email can be combination of plain text or word file. Max attachment size to be 25mb
S003	Development Team	Stakeholders requirements, functional and non functional requirements	Google Meet	Twice in 3 weeks	The requirements given to them are final and need no change	Website update must not fall during holiday change freeze.
S004	Documentation Team	Coming soon update on new features and go live help text. Provide in English and Spanish.	Google Meet, Email and Face to Face	Once a week	None	Documentation may not get all the information from stakeholders in one meeting
S005	UI Designer	Color scheme and theme of design you want to follow	Google meet	One time only	None	None
S006	Software Testing Team	Which parts of code has been exposed to latest changes	Face to face meet	First of every month	None	None

Figure 17: Project Communication Plan

PROJECT PROCUREMENT PLAN

Introduction

The purpose of Procurement Plan is to setup a comprehensive plan which will help to acquire goods in a timely and cost effective way to help to complete our project. It will help to point out goods and services we need for our project, the type of contracts that we will have with our vendors, contract approval procedures and decision standards. Different things remembered for the procurement management plan incorporate procurement risk and procurement risk management examinations; how costs will be resolved; how standard procurement documentation will be utilized; and procurement requirements.

Procurement Definition

The following items or services are required to carry out the project smoothly. The list of following items has been given to our supervisor for review and approval.

Table 2: Procurement table

Item/Service	Justification	Needed By
Twitter Developer Account	Need to get access to user's data and provide access like read, write etc	31st July, 2021
Facebook Developer Account	Need it to gather user's data from Facebook and perform activities	31st July, 2021
Instagram API	Needed to gather user's Instagram data	31st July, 2021
Private Room	Needed For project meeting with project manager to discuss important facts and figures	3rd September, 2021

Name	Role
Name	**Role**
Dr. Tahir Mustafa Madni	Project Manager
Waleed Umar	Development Team Member
Aseed Ali Khokhar	Development Team Member

Procurement Management Approach

The Project Manager will supervise and manage all procurement exercises under this project. The Project Manager will work with the project group to identify all things to be purchased for the successful completion of the project. The agreements and buying office will survey the procurement things, decide if it is valuable to make or purchase the things, and start the business choice, buying and the contracting dealings.

Type of Contract to be used

The type of contract used would be **Time and Material Contract** where will pay on basis of 3 month cycles for a fixed number of API calls and access levels for our APIs for Facebook, Twitter and Instagram.

Procurement Risks

Like everything else, resource procurement has some risks involved in it which must be handled to carry out the project as planned. All these risks will be catered by keeping in mind the strategies defined in the risk management plan. These risks are not complete and the standard risk management process of identifying, documenting, analyzing, mitigating, and managing risks will be used. Some of the risks are as followed:

1. API service server down for maintenance
2. Change in the API calls plan
3. Change in privacy policy of the service provider

Procurement Risks Management:

As expressed in the above section, project risks will be overseen as per the project's risk management plan. However, for risks related explicitly to procurement, there should be extra thinking and discussion among the members involved in the project.. Also, any plans regarding the procurement of any source must be shared with the vice president of contracts, in our case the supervisor of the project, before implementation. Any issues concerning procurement actions, or any newly identified risks will instantly be communicated to the project's contracting department point of contact as well as the project sponsor.

Cost Management

Since the data we require is highly specific, we do not have luxury to go to different vendors or data providing services except the official platforms of the Social Media Platforms under question. We will contact the developer team of Instagram, Facebook and Twitter in order to get ourselves approved and get access to the data of users of their platforms. We will ask for different plans for their services and will choose the best among them which will help cater the requirements of our project.

Procurement Constraints

There are certain constraints that we have follow while procuring services from other organizations. These should be kept in mind while performing negotiations with the organization from whom we are acquiring services.

These constraints are scope, cost and time.

1. **Scope:** All the activities will have to be performed in accordance with the scope of the document. If any good or service does not help in fulfilling our scope requirements then there is no need to pay for them
2. **Time:** The time for project is fixed and cannot be changed so the procurement activities should be completed in the given time.
3. **Cost:** Project cost has risk and administration resources built in; however, these resources may not be applied to procurement activities. Resources are only to be used in the event of an accepted change in project scope or at administration's decision.

Contract Approval Process

The first step is to list down all the resources and point out which one needs to be acquired from outside and which can be available within the organization. After this a cost review will take place where the total cost that will occur on procurement will be done. After cost analysis is done, it would be given to project supervisor who would then accept or reject the purchase of services.

Decision Standards

There are certain standards that were considered while making decisions regarding going through with the purchases. These standards are as follow:

1. Cost
2. Time
3. Quality
4. Support Team
5. Documentation/ Tutorial regarding use of service

STATEMENT OF WORK

Scope of Work

The purpose of the project is to develop a mobile application and a website using Flutter which will monitor the activity of the user on various popular social media platforms. It will monitor the activity of the user and with the help of various machine learning algorithms will check if he or she has been subjected to harassment or online bullying.

In order to train the machine learning models on high amount of data to make it more efficient, we need to access the GPUs. This is the only hardware resource that we need for our project. In terms of software resources, we need access to various APIs but the most important ones without which our system is nothing is the APIs offered by Facebook, Instagram and Twitter in order to have access to the user activity to perform analyses.

Location of Work

The location of work depends upon the type of work we want to carry out. We cannot define a fix place for all activities for our project. So the location of work for our project are as followed:

1. A conference room to conduct discussions with our supervisor and show our progress and discuss future plans
2. Machine Learning lab to get access to GPUs in order to train our machine learning models
3. Hostel/ Home for development task as all the tasks can be carried our remotely and team members can communicate using Google Meet or MS Teams

Period of Performance

The project evaluation is divided into 3 phases. It is to be started in 1st week of August. All other information is given below:

1. First evaluation in October with 40% work completion
2. Second Evaluation in January with 70% work completion
3. Third Evaluation in April with 100% completion along with Testing report
4. 5 hours a day with 5 days a week to be given on the project.

Project Deliverables

NO	Deliverable	Type	Date
1	Proposal	Hard + Soft Copy	30th May 2021
2	Software Requirement Specification	Hard + Soft Copy	1st September 2021
3	Software Design Document	Hard + Soft Copy	6th October 2021
4	Progress Report	Hard + Soft Copy	Every week
5	Testing Report	Hard + Soft Copy	After every integration cycle
6	Prototypes	Soft Copy	20th July 2021
7	Software Product	Cloud + App source code	25th April 2022

Acceptance Criteria

The acceptance criteria is that the system meets all the project requirement as described in the scope document, the result it displays is efficient and it is completed within time and agreed cost.

STAKEHOLDER MANAGEMENT ACTIVITIES

STAKEHOLDER MANAGEMENT PLAN

Introduction
This stakeholder management plan will help in identifying and find out stakeholders for this project. It will also help in identifying their influence and impact on the project and the means of communication between them. This will help the project in achieving its objectives and utilize its resources in maximum possible way.

The identification of stakeholders and the mod of communication between them is very important to be cleared in the early stage of the project as it has a direct relationship with the success of the project. The lack of communication or timely communication can result in missing requirements which can affect the scope and overall working of the project. It is very important to point out stakeholders who have interest in the project because if you keep on communicating with the wrong person who has no impact on the project it can be very harmful for you down the lane.

Identifying Stakeholders
Identification of stakeholders is very important step. Its importance is already discussed in the paragraph above. For this purpose a brainstorming session will be held to pin point the primary and secondary stakeholders. In order to do this, there are certain questions whose answers can help achieve this feat. Some of them are as follow:
1. Will the chosen person or organization be directly affected by the project?
2. Will the chosen person or organization has direct affect or influence on the project?
3. Does the chosen person or organization gain any benefit from the project?

Anyone who falls on the criteria of the questions given above will be considered as a stakeholder for this project.

Table 3: Stakeholders for the project

Project Sponsor	COMSATS University Islamabad
Stakeholder	- Group Member: Waleed Umar (FA18-BSE-102) - Group Member: Aseed Ali Khokhar (FA18-BSE-015) - Project Supervisor Name: Dr. Tahir Mustafa Madni - Co- Supervisor Name: Dr. Uzair Iqbal - Final Year Project Committee: Evaluation of the Project

Key Stakeholders

After the initial stakeholder finding session, the next task is to find the key stakeholder or those who can directly influence or change the scope of the project. These stakeholders should be under contact frequently as their involvement can change the course of the project.

The key stakeholders for our project are stated below:

Table 4: Key Stakeholders

Stakeholder	• Group Member: Waleed Umar (FA18-BSE-102) • Group Member: Aseed Ali Khokhar (FA18-BSE-015) • Project Supervisor Name: Dr. Tahir Mustafa Madni • Co- Supervisor Name: Dr. Uzair Iqbal

Stakeholder Analysis

After identification of the stakeholders which are involved in the project, next step is to analyze them individually. The main purpose of this analysis is to identify and categorize on basis of their influence and impact on the project.

After identification and categorization of each stakeholder, the team will then use a power-interest chart to show the possible impact a particular stakeholder may have on the project. After that the chart will be represented in the form of a matrix. On the basis of these analysis, a complete stakeholder analysis chart will be made which will show the concerns, interests, power, involvement and levels of each stakeholder. We will keep on updating the stakeholder matrix chart with the progress of project

Following is **power interest chart** for our project:

Table 5: Power Interest Chart

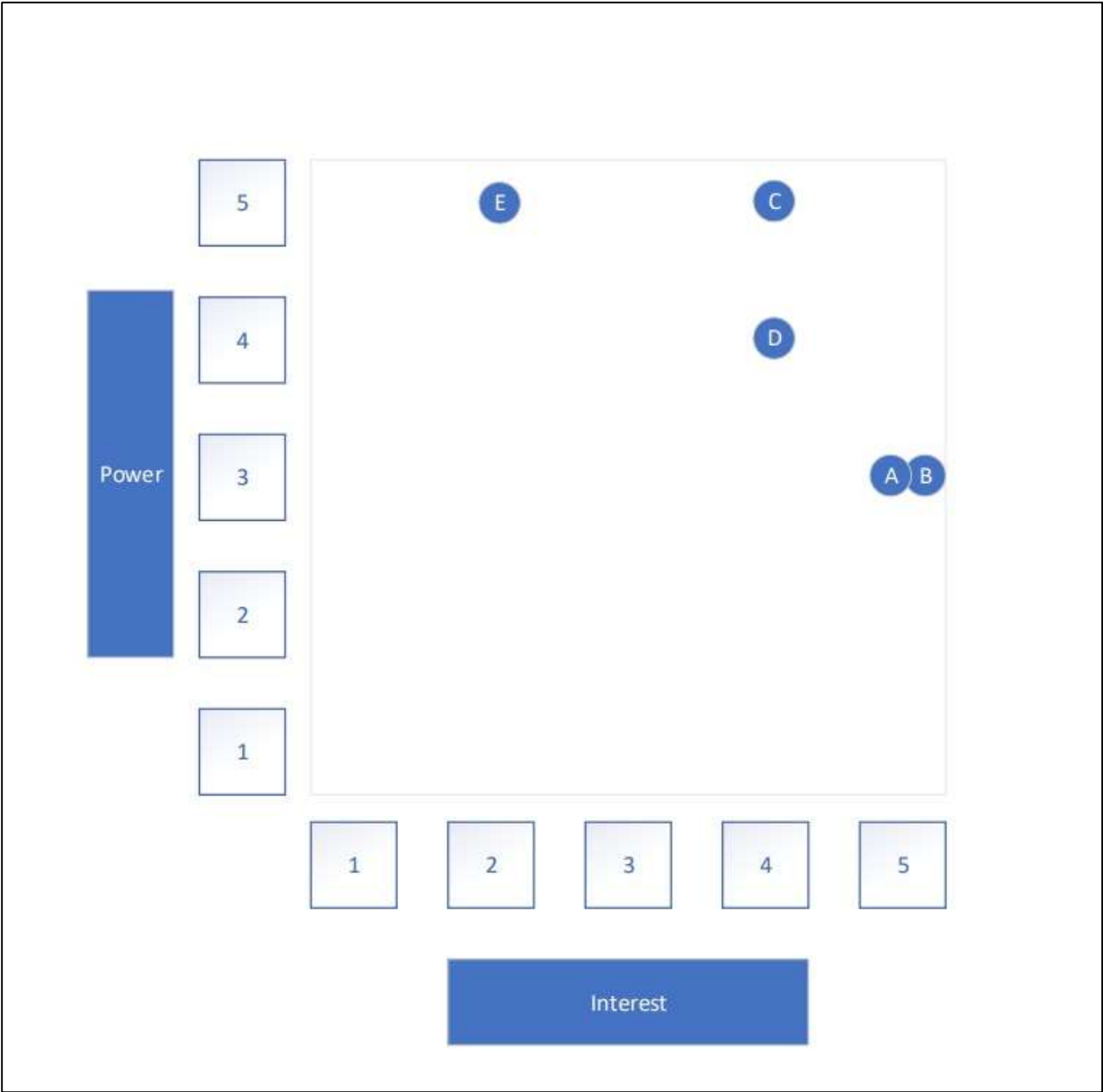| Key	Organization/Designation	Name	Power (1-5)	Interest (1-5)
A	Students/Developers	Waleed Umar	3	5
B	Students/Developers	Aseed Ali Khokhar	3	5
C	Supervisor	Dr. Tahir Mustafa	5	4
D	Co- Supervisor	Dr. Uzair Iqbal	4	4
E	Evaluation Committee	Evaluation of Project	5	2

Following is **power interest matrix** for our project

Figure 18: Power Interest Matrix

COST MANAGEMENT

Earned Value Analysis

|	Task Name	Planned Value - PV (BCWS)	Earned Value - EV (BCWP)	AC (ACWP)	SV	CV	EAC	BAC	VAC	CPI	SPI	Add New C
1	▲ 1 Social Media Analysis for abnormal event detection	$314,500.00	$154,799.67	$136,800.00	-$159,700.33	$17,999.67	$545,787.22	$617,600.00	$71,812.78	1.13	0.49	
2	▲ 1.1 Research	$12,000.00	$12,000.00	$12,000.00	$0.00	$0.00	$12,000.00	$12,000.00	$0.00	1	1	
3	1.1.1 Analysis of related videos	$4,000.00	$4,000.00	$4,000.00	$0.00	$0.00	$4,000.00	$4,000.00	$0.00	1	1	
4	1.1.2 Analysis of related literature	$8,000.00	$8,000.00	$8,000.00	$0.00	$0.00	$8,000.00	$8,000.00	$0.00	1	1	
5	▲ 1.2 Documentation	$0.00	$0.00	$0.00	$0.00	$0.00	$48,000.00	$48,000.00	$0.00	0	0	
6	1.2.1 Scope Document	$0.00	$0.00	$0.00	$0.00	$0.00	$12,000.00	$12,000.00	$0.00	0	0	
7	1.2.2 SRS Document	$0.00	$0.00	$0.00	$0.00	$0.00	$36,000.00	$36,000.00	$0.00	0	0	
8	▲ 1.3 Account Management Modules	$32,000.00	$7,999.67	$0.00	-$24,000.33	$7,999.67	$32,000.00	$32,000.00	$0.00	0	0.25	
9	1.3.1 User Account Management System	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	0	0	
10	1.3.2 Admin Privilege System	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	0	0	
11	▲ 1.4 API Procurement	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	0	0	
12	1.4.1 API Keys Procurement	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	0	0	
13	▲ 1.5 Data Preparation	$20,000.00	$10,000.00	$0.00	-$10,000.00	$10,000.00	$20,000.00	$20,000.00	$0.00	0	0.5	
14	1.5.1 Data Scrapping	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	0	0	
15	1.5.2 Data Cleaning	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	0	0	
16	▲ 1.6 Development	$250,500.00	$124,800.00	$124,800.00	-$125,700.00	$0.00	$489,600.00	$489,600.00	$0.00	1	0.5	
17	1.6.1 Sentiment Analysis	$33,600.00	$16,800.00	$16,800.00	-$16,800.00	$0.00	$33,600.00	$33,600.00	$0.00	1	0.5	
18	1.6.2 Activity Analysis	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	0	0	
19	1.6.3 Virtual Chatbot	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	0	0	
20	1.6.4 Recommendation System	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	0	0	
21	1.6.5 Development of Mobile Application	$70,700.00	$36,000.00	$36,000.00	-$34,700.00	$0.00	$144,000.00	$144,000.00	$0.00	1	0.51	
22	1.6.6 Development of Website	$146,200.00	$72,000.00	$72,000.00	-$74,200.00	$0.00	$288,000.00	$288,000.00	$0.00	1	0.49	
23	1.6.7 Data Visualization	$0.00	$0.00	$0.00	$0.00	$0.00	$24,000.00	$24,000.00	$0.00	0	0	
24	▲ 1.7 Testing	$0.00	$0.00	$0.00	$0.00	$0.00	$16,000.00	$16,000.00	$0.00	0	0	
25	1.7.1 Unit Testing	$0.00	$0.00	$0.00	$0.00	$0.00	$8,000.00	$8,000.00	$0.00	0	0	
26	1.7.2 Integration Testing	$0.00	$0.00	$0.00	$0.00	$0.00	$8,000.00	$8,000.00	$0.00	0	0	

Figure 19: Earned Value Analysis
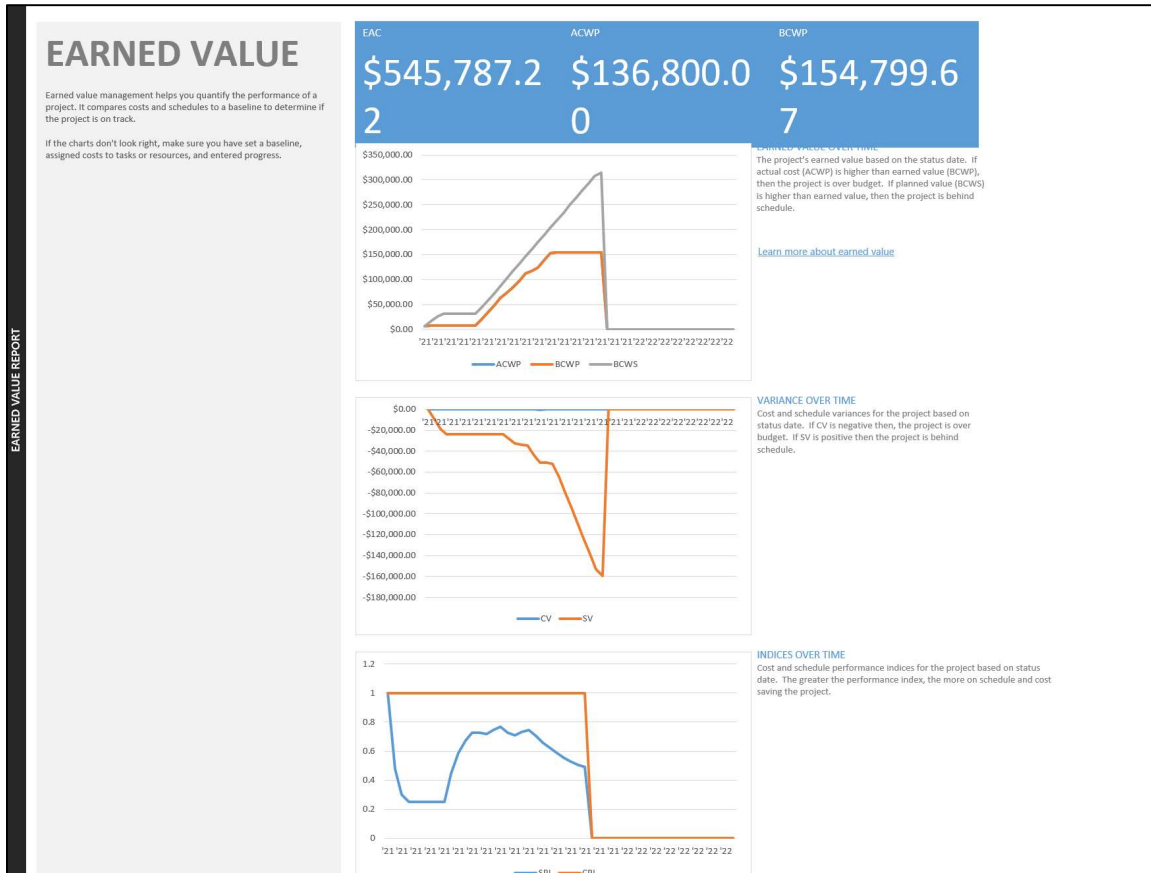
Figure 20: Earned Value Analysis

Definitions of some important terminologies

- The **planned value (PV),** formerly called the budgeted cost of work scheduled (BCWS), also called the budget, is that portion of the approved total cost estimate planned to be spent on an activity during a given period
- **Actual cost (AC),** formerly called actual cost of work performed (ACWP), is the total of direct and indirect costs incurred in accomplishing work on an activity during a given period
- The **earned value (EV),** formerly called the budgeted cost of work performed (BCWP), is an estimate of the value of the physical work actually completed

PROJECT RISK MANAGEMENT ACTIVITIES

Introduction

Risk management is an important factor while selecting a project to work on. Whenever a company start working on the project and select a venture, it has certain risks involved in it. This is where **Risk Management Plan** comes in handy as this plan covers the risks involved, the methodology to covert these issues. The plan helps to understand the risk involved, the methodology used to find out risks in the project.

Top Risks Involved

There are different level of risks involved in a project. Some are mild which do not cause any serious harm to the project then there are some who needs to be identified and corrected as they may affect the working of the project in an adverse way. Following are some risks that can have an adverse effect on our project and ways should be considered to tackle them.

Internet Non–Availability:

This issue can rise due to number of reasons like infrastructure maintenance of the internet service provider, jamming of signals in particular area due to law and order issues. As a result our system will not work as it would not be able to connect with API servers and collect data in order to perform different machine learning predictions.

Change in Data Gathering Laws:

Since gathering of user data and tracking his social media activity is an integral part of our project, if there are any changes in data collection laws it will affect our system. There would be restrictions on the type of data an application can gather or big companies can share to third party systems which can restrict the working of our systems.

Change in API calls per user:

This risk has direct link with scalability with our system. At this moment, Facebook offers 200 calls per hour per user. So in future if it decreases to 150, it will affect the scalability of our system.

Risks Identification

Risk identification is an integral part of Risk Management Plan as it helps to point out risks that can affect the working of the system. There are various techniques that we can use to find out potential risks for our system.

Delphi Technique:

The main idea of Delphi technique is to reach consensus among the panel of experts on a particular topic. The Delphi technique uses repeated rounds of questioning and written responses, including feedback to responses in earlier rounds, to take advantage of group input while avoiding the possible biasing effects of oral panel deliberations

Review of Similar Projects:

In this technique, we will study literature of related systems along with the research papers on machine learning techniques used in our project. In this way we can make some predictions about the type of errors we can encounter in our system.

Risk Qualification and Prioritization

After identifying risks, the next step is to prioritize risks based on the impact they can have on the working of the project. To do this we will use **Probability Impact M**

High		No internet connection issue	
Medium	Change in API calls per user		Change in Data Gathering Laws
Low			
	Low	**Medium**	**High**

Probability

On **X-Axis: Probability of risk to occur**
On **Y-Axis: Impact it has on the project**

Risk Mitigation and Avoidance

The project manager has driven the project group in creating reactions to each identified risk. As more risks are recognized, they will be qualified, and the group will make avoidance and mitigation techniques. These risks will likewise be added to the Risk Register and the project intend to guarantee that they are checked at proper times and are reduced.

Risk Register

After finding all the probable risks that can occur in a project, we log them in a risk register. The risk register contain multiple categories on the basis of risk impact and risk probability.

No.	Rank	Risk	Description	Category	Root Cause	Triggers	Potentitial Response	Risk Owner	Probability	Impact	Status
1	R1	Change in data gathering laws	Since gathering of user data and tracking his social media activity is an integral part of our project, if there are any changes in data collection laws it will affect our system. There would be restrictions on the type of data an application can gather or big companies can share to third party systems which can restrict the working of our systems.	Legal	Utilizing the system where there is noisy environment	Restriction on type of data to be gathered	The systeme will be trained to work with restricted data	Development Team, Project User	High	Medium	Less data of user will be captured
2	R2	Internet Non-Availability	This issue can rise due to number of reasons like infrastructure maintenance of the internet service provider, jamming of signals in particular area due to law and order issues. As a result our system will not work as it would not be able to connect with API servers and collect data in order to perform different machine learning predictions	Network Error	Server Maintenance or service shutdown due to law and order situation	Unable to connect with Social Media APIs to get data	Internet backup should be available	Project User	Medium	High	User will wait for the internet connectivity to resume operations
3	R3	Change in API calls per user	This risk has direct link with scalability with our system. At this moment, Facebook offers 200 calls per hour per user. So in future if it decreases to 150, it will affect the scalability of our system	Software Technology	Change in policy by the companies	The amount of data gathered will be reduced	Offer a paid version to the user to increase API response time for the product	Project User	Low	Medium	The number of API calls that the system can make will be reduced

Figure 21: Work Register