UTM
UNIVERSITI TEKNOLOGI MALAYSIA

FACULTY OF COMPUTING
UTM Johor Bahru

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SYSTEM ANALYSIS AND DESIGN

PROJECT PROPOSAL

UrbanRide

(ADVANCED PUBLIC TRANSPORTATION SYSTEM)

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1.0 Introduction

A bus system is an important component of urban transportation infrastructure, providing a cost-effective and accessible mode of public transit for millions of people worldwide. It is one of the most used public transportation for numerous countries. This system comprises a network of buses operating on designated route with designated stops, serving as a crucial link for commuters within cities and sometimes connecting different regions.

UTM Fleet is a crucial unit within the Service Cluster of the Office of the Deputy Vice Chancellor (Development) at Universiti Teknologi Malaysia (UTM). This unit is responsible for the management and operation of the university's vehicle fleet. With a dedicated staff of competent professionals, UTM Fleet ensures the efficient utilization, maintenance and serviceability of vehicles that are essential for various university functions, activities and daily-used buses. UTM Fleet has provided a schedule for the shuttle bus in UTM Smart for their users to refer.

Shuttle bus service in UTM that is provided to all the students and staff is reliable transportation for students, faculty, staff and visitors. It facilitates their movement between different parts of campus. This includes transportation to and from classes, libraries, dormitories, administrative offices, sports facilities and other campus amenities. This is the most used and only choice for most of the UTM students, especially for those who do not own a vehicle.

Interview

Interview audio record link:
https://drive.google.com/file/d/1WJZFRMLxPmU71mWdzIxa-AQDsryzY6in/view?usp=drive_link

Dialog: Chew : Hello, Mr Afiq?

Mr Afiq : Yes, it's me.

Chew : I'm the one who called at 11 o'clock, if I'm not mistaken, to talk about the short i Interview.

Mr Afiq : Okay, alright.

Chew : First, I'm Chiu from Student Software, year 1.So, i want to ask Mr Afiq, What is your Position in UTM Fleet?

Mr Afiq : Okay, Let me introduce myself, I'm Muhammad Afiq Hazri the legal Officer in UTM Fleet, I'm incharge of the unit in UTM Fleet.

Chew : Thank you Mr Afiq, So what i want to ask is, How many buses are there in UTM Fleet?

Mr Afiq : okay, the buses that we have, which are still running and operating are about 22 buses.However, for the shuttle campus movement, the buses that are running Involving only us are 8 buses. Only 11 buses are added to the bus contract. That is The F390 bus, so in total there is 19 buses

Chew : So, for the UTM Fleet, is there any online system?

Mr Afiq : Of course we have which is VRMS stand for vehicle reserve management system That is the place to make an official bussiness.

Chew : If we talk about the usual buses that use by student, we have the schedule bus at UTM smart right?

Mr Afiq : That's right, at UTM Smart also we have the shuttle bus categorised by 8 zones In total. In addition, for your information we have our own website which called UTM Fleet. We also have our own Facebook page and Tiktok to wider and promote UTM Fleet as following this technology era. Furthermore, we are not only provide Services for UTM's staff and students only, but also the external customer.

Chew : So, Mr Afiq, is there any complaint from staff or students that use the shuttle Bus buses

Mr Afiq : From the user, I think there are a few complain but not a lot. It's not a big complaint. Because in case there is someone, who is different, I don't think it's

everyone.Maybe there are some students because maybe they forgot to follow up. Maybe they don't Know where to follow up our current information.

Chew:Do you think GPS system will help to improve current system?

Mr Afiq: GPS system is good,it represents a significant change from the current system.

Chew:Yes,In this GPS system, there is a tracking system that allows users to select their desired zone. For example, if a user selects zone A, they can see how many buses are currently operational and their routes on the map. This will provide students with more resources to estimate the correct arrival time. While this idea may require high-quality internet coverage throughout UTM, it is a good idea that will definitely improve our system and demonstrate to users that we are striving to provide better services.

Chew: Actually, I have some suggestions from my proposal. Firstly, as you mentioned, the live updating of bus locations. Secondly, drivers can update the bus condition, indicating if the bus is full or not. This information will appear in the system, allowing users to decide if they want to wait for the next bus. Additionally, if a bus encounters an unexpected incident, such as a flat tire or breakdown, drivers can manually update the information themselves, instead of relying on management to do so, which would take more time. Another suggestion is that if the bus route changes due to traffic or an event, the system will send notifications to users.

Mr Afiq: That's a good idea, but there is no costing for now, right?

Chew: No, for now, it's just a proposal.

Mr Afiq: That's good, all the ideas are decent.

Chew: Lastly, I also came up with an idea. Users can send notifications to drivers to remind them of bus stops where users are waiting. This can help prevent drivers from skipping bus stops unintentionally, as sometimes they might not see waiting passengers. Additionally, there are cases where drivers stop at a bus stop, but passengers do not board because they just want to stay at the bus stop. This feature can save drivers time and increase productivity.
Afiq: I strongly agree with this one because there are always complaints like this, and this feature is definitely going to help a lot.

Chew: If it has some of these features, do you think it is feasible or not? That means it can be run or not?

Mr Afiq: I think I agree with what you suggested, this will make managing our drivers easier. Our users will also benefit from that. I think it is a good idea, means the idea you came up with is really good. The notify driver feature can really help drivers,

staffs and students. After that, the feature about the changed line or the time of emergency, that's notifying too, right? Passengers who are already full can also notify. That's like additional information.
Chew: So, if the one about our proposal, sir, do you have anything to suggest? What to add, and what can not be carried out?

Mr Afiq: This is all that has not been done yet, which means we can improve it. Our system still has shortcomings, but the system you have created may also face constraints. For example, the internet is interrupted, the internet coverage is not enough for every area in the campus. But that might involve cost, if that is just a proposed idea, it's ok. If I think so, maybe the notification will reach the passengers, meaning the notification route, you have to make sure the students know. This is the most important thing, if we done the system then the passengers don't know, that's what we're worried about. So we have to make sure that the system we have created, all users know it. What is your name? That's all, I don't have anything to add to your system, I think that your ideas are not in the system now. For the previous system, we only made a report, meaning the students who complained, and then improved it.

Chew: If it's like you said, if UTM Fleet wants to have a new system, we have to use GPS right? What is our process to realize our idea?

Mr Afiq: Yes, we have to do a trial, for what we do, once we get an idea, we will have 2 meetings. The first and second meeting is when the system is ready, we will continue to activate our system. Continue to implement online, do a trial, see what our system lacks, so we can improve it. We also try to settle it. Sometimes, the GPS system does not work on buses. So we need to try and error. And maybe we should also try to get more users to open accounts. I think it's ok if not many people open, but we will do a trial first. It takes time. Once we announce it in the media, so the users know, we have prepared to provide such a service.

Chew: I think that's all what I want to ask, thank you Mr. Afiq.

Mr Afiq: Ok, if then after this you have any question, you can come to my office and meet me. Thank you. Bye.

Chew: Bye.

2.0 Background Study

UTM Fleet has provided shuttle bus service for all the students and staff in UTM. For now, students can only refer to the bus schedule that was uploaded in UTM Smart. However, many users have experience of waiting indefinitely at the bus stop. Even though the arrival time that was written in the schedule is up, they still could not see a single bus. Sometimes, there are some bus drivers who do not follow the schedule and take a break early. That causes the whole schedule to drag, and the users might be late for their class or meeting. Due to all of the disadvantages of the current bus system, we have contacted Mr. Afiq and have an interview about the problems that are faced by the current bus system.

Mr. Afiq is one of the experienced managers of the UTM Fleet. In the interview, Mr Afiq told us of course they have received several complaints from some users about the schedule, the time of arrival of the bus and so on. They are still in the process of figuring out how to solve these problems and provide better service to students and staff. We have suggested our solutions based on the problems their current systems are facing now. We believe our solution can help them to solve the current problems and enhance the using experience for their customers.

Our idea is mainly to create more interaction between the buses with their users. We proposed some ideas to avoid the existing problem from happening again. After hearing the ideas that we proposed, Mr Afiq thought that we had provided some constructive and effective solutions. Mr Afiq also gave us some advice and is also looking forward for our project. He trusts that the enhanced system of UTM Fleet will allow them to provide better service to their users.

3.0 Problem Statement

Among most of the complains that Mr Afiq receive for the current system is:

1. Accuracy of arrival time of the bus
    - The problem that most users complain about is the arrival time for the buses to arrive at the destination is inaccurate. Although UTM Fleet provides their users a fixed schedule for all their buses, that is not enough yet for their users to plan their journey. For instance, if one trip of the bus is delayed because of the traffic jam, the whole schedule will be affected. We cannot expect the traffic condition to be the same for all the days, this is why we need something to update the arrival time continuously in order to keep users updated about the new estimated arrival time.
2. Availability of the seat of buses
    - Users are not clear about the condition, they do not know how many seats are still available for the bus they want to take. This will cause even though the bus they are waiting has reached, the bus is full and there are no seats for them.
3. Uncertainty factors
    - If any unexpected things happen, users do not know what is the current status for the bus. When the bus is involved in a traffic accident, the tire punctures, jams in traffic and so on. They will wait indefinitely for the bus they want to fetch them at the bus stop.
4. Line changes
    - Users do not know when there are any line changes or which bus is now under maintenance. This might waste their time for the sake of waiting for a bus that does not operate for a certain duration.
5. Bus do not stop for people at the bus stop
    - Sometimes, users have experience of waiting for so long at the bus stop, when they see the bus they want to take, they wave to it but it does not stop for them either. This makes them frustrated and think that the current bus service is unreliable. Most of the time this happens because the bus driver is not sure about whether the people at the bus stop are waiting for this bus or another one.
6. Rating and feedback
    - For the current system, it is very inconvenient for the user to give us feedback and also rating. This makes many users not satisfied with the current system. They only can dial-in when it is office hour, if not no one will answer their call and listen to them. Feedback is one of the most effective methods for us in order to improve our system via the comments from the users.
7. Safety factors
    - For the current system, sometimes it is quite dangerous for both users and drivers. If any unexpected accident happens, they do not have any method in order to let others know they are in danger. This is also one of the reasons that make most of the public transport users avoid taking public buses.

4.0 Proposed Solution

1. Live updating location
    - We proposed the live updating location in order to solve the arrival time inaccurate problem. All of the traffic conditions will be displayed on the mobile application that our users use. This would allow them to estimate the arrival time of the bus and plan their journey early. It helps them to plan their trip more efficiently and reduce waiting time. This enhances our passengers' experience by giving more control and transparency during their journeys. It reduces uncertainty and frustration when waiting for buses.

2. Available seat display in application
    - By using this function, we can ensure that all the users of our service know how many available seats on the bus from time to time. This can help them avoid overcrowded buses and adjust their travel times accordingly. The main reason for us to implement this function is for the passengers with specific needs, viz elderly individuals, pregnant women or passengers with disabilities. This benefits them from knowing the availability of priority seating options or seats near accessible features like ramp or designated spaces.

3. Announcement and notification of line changes
    - With the advance notice of line change, our users can adjust their trip plans accordingly. This allows them to find alternative routes, plan for additional travel time or make other arrangements as needed.

4. ‘Booking’ system for users
    - We prepared a booking system for our users. Once they arrive at the bus stop, they can see all the buses that will stop at that bus stop and the estimated time for the buses to arrive. They can click the ‘Select this bus’ icon to reserve themself a seat on the bus. This works like how the cinema booking seat system works. This can ensure that the bus will stop at the bus stop to pick them up, this eases the work of drivers and ensures that all the passengers can take the bus with no worries.

5. Rating and feedback function
    - Feedback from our users provides us valuable insights into their experiences, this allows us to identify areas for improvement in future. This includes some aspects which are cleanliness, punctuality, driver behavior, confort, accessibility and overall ride experience. This can also help in monitoring and maintaining our system and service quality. This helps us in determining the aspect of we need to improve and help in continuous improvement.

6. Emergency buttons
    - Emergency buttons contribute to our users safety by providing a direct communication channel such as police, ambulance and also our company management for reporting emergencies. These buttons are typically designed to be accessible to all passengers, including those with disabilities or mobility limitations. This ensures that everyone on the bus has a way to call for help when needed. We try our best to provide our users a safe environment, in order to prevent them becoming a victim of misconduct, harassment or other inappropriate behaviors on buses.

According to our study and also Mr Afiq, these proposed solutions are feasible. From the aspect of technical feasibility, the current technical resources are sufficient for the new system. Besides, this system has met most of our users' needs referring to their feedback for the current system. Secondly, this system is also operational feasible. The human resources are available to operate the system once it has been installed. On top of that, our users need a new system to replace the current traditional system. Thirdly, our proposed system is also economically feasible. According to the cost-benefit analysis (CBA), we have the profitability index of 2.26, showing that it is a good investment because its index is more than one.

Economic feasibility (CBA)

Assumptions	
Discount rate	10%
Sensitivity factor (costs)	1.2
Sensitivity factor (benefits)	1.1
Annual change in production costs	5%
Annual change in benefits	10%

Estimated costs	
Hardware	RM 15000
Software development	RM 12000
Maintenance	RM 3000 per year
Advertising	RM 4000 per year
Salary	RM 35000 per year

Estimated Benefits	
Increase Sales	RM 52000 per year
Savings	RM 27000 per year

Costs	Year 0	Year 1	Year 2	Year 3
Development cost				
Hardware	18000			
Software development	14400			
Total	32400			
Production Cost				
Advertisement		4800	5040	5292
Salary		42000	44100	46305
Maintenance		3600	3780	3969
Annual Production Cost (Present Value)		50400 45818	52920 43736	55566 41748
Accumulated Costs		78218	121954	163702

Benefits	Year 0	Year 1	Year 2	Year 3
Increase Sales		57200	62920	69212
Saving		29700	32670	35937
Annual inventory costs (Present Value)		86900 79000	95590 79000	105149 79000
Accumulated benefits		79000	158000	237000
Gain or Loss		782	36046	73298
Profitable Index (PI)	2.26			

5.0 Objective

We had set objectives to enhance and improve clients' experience which had been menti*oned* above:

1.Implementing a live location tracker on each bus to reduce waiting times by allowing passengers to anticipate bus arrival times.

2.Provide user convenience by creating a system for users to notify driver which bus station have passengers want to take a ride, reducing the need for buses to stop at unnecessary stops or skip bus stop without reason.

3.Provide client with implementing a feedback and report system for users to report any system failures, feature issues, or inaccurate information, improving overall reliability

4.Provide emergency button in case user face unexpected incident when they are on bus

5.Provide newest information, update or change on bus routes,bus model,bus , bus stop,bus station maintenance to client

6.0 Scope of project

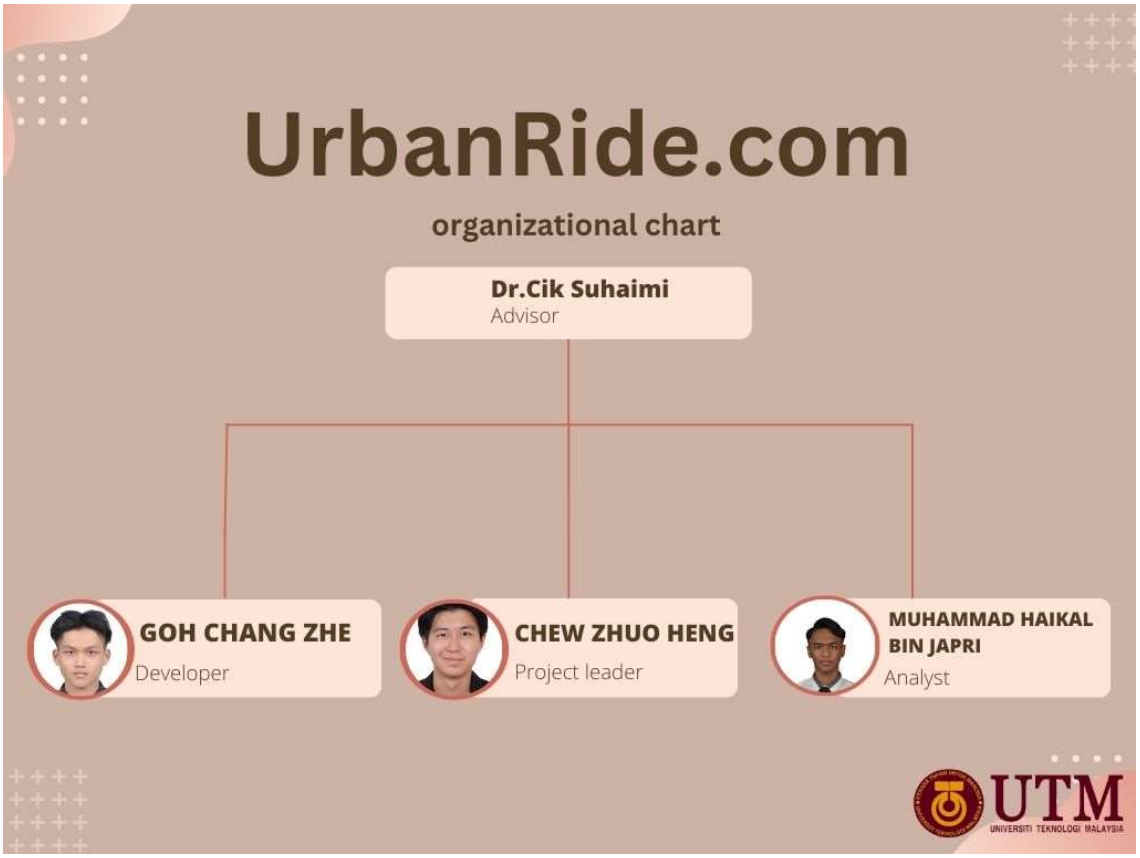
We are developing an Android and iOS mobile application with the express purpose of making it easier for our target audience, UTM transportation users to obtain information about the bus they are interested in. Users of the program must create an account with a password and email address. The user will next be required by the system to input the two-step verification. Thus, it will demonstrate how tightly secured our system is. Furthermore, the program will inquire as to whether the user is the driver or a passenger. Consequently, the interface will alter based on their functioning.

They are permitted to change their personal data and bus-related information in driver mode. In addition, they need to double verify with the control system and estimate how long it will take them to board and arrive based on the conditions on the route. For the benefit of the users, they will then be informed whether the bus is approaching the bus stop. Therefore, the drivers won't cut corners and make the passengers wait too long.

The passenger interface differs somewhat since they are our system's clients. They are able to modify their personal information, but not the bus schedule.The screen will then display the timing of boarding and arrival at each bus stop based on the current road conditions.

7.0 Project planning

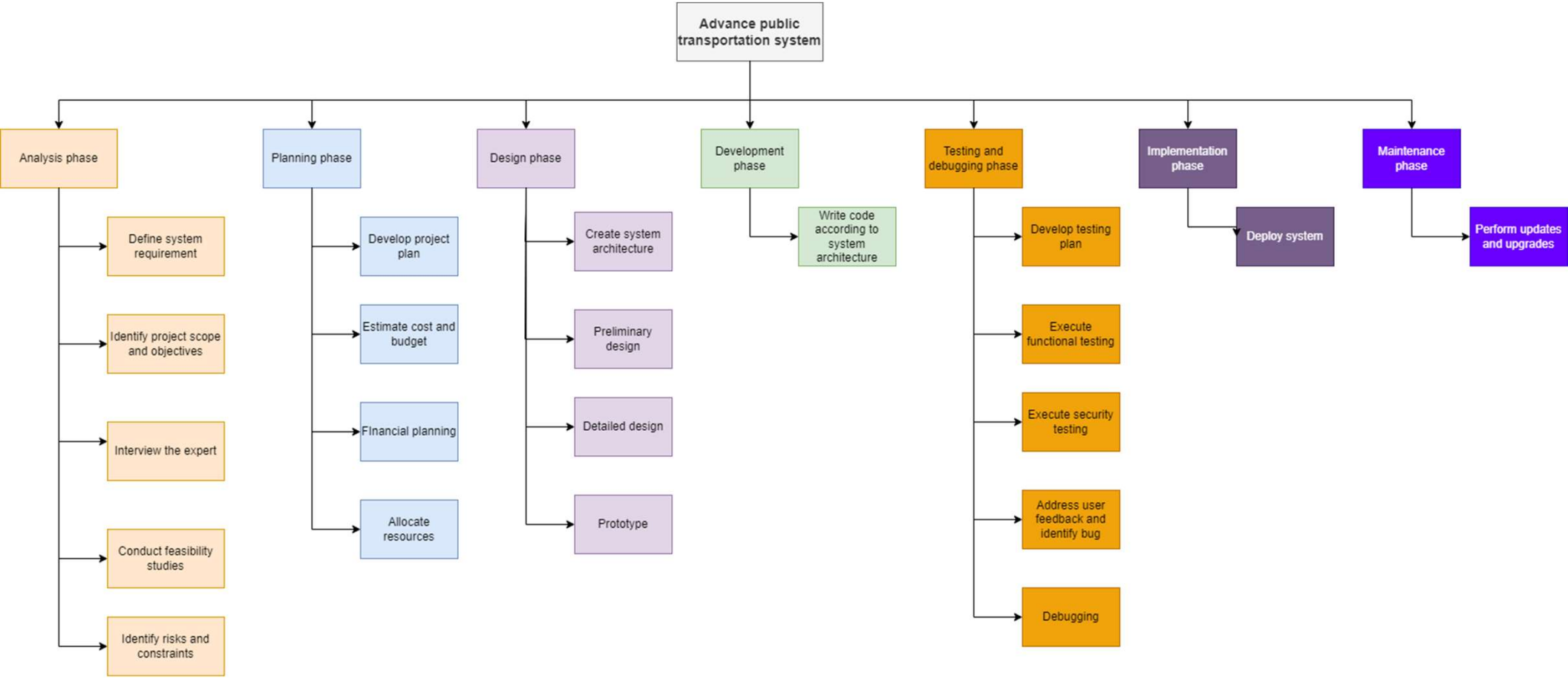
7.1 Human Resources



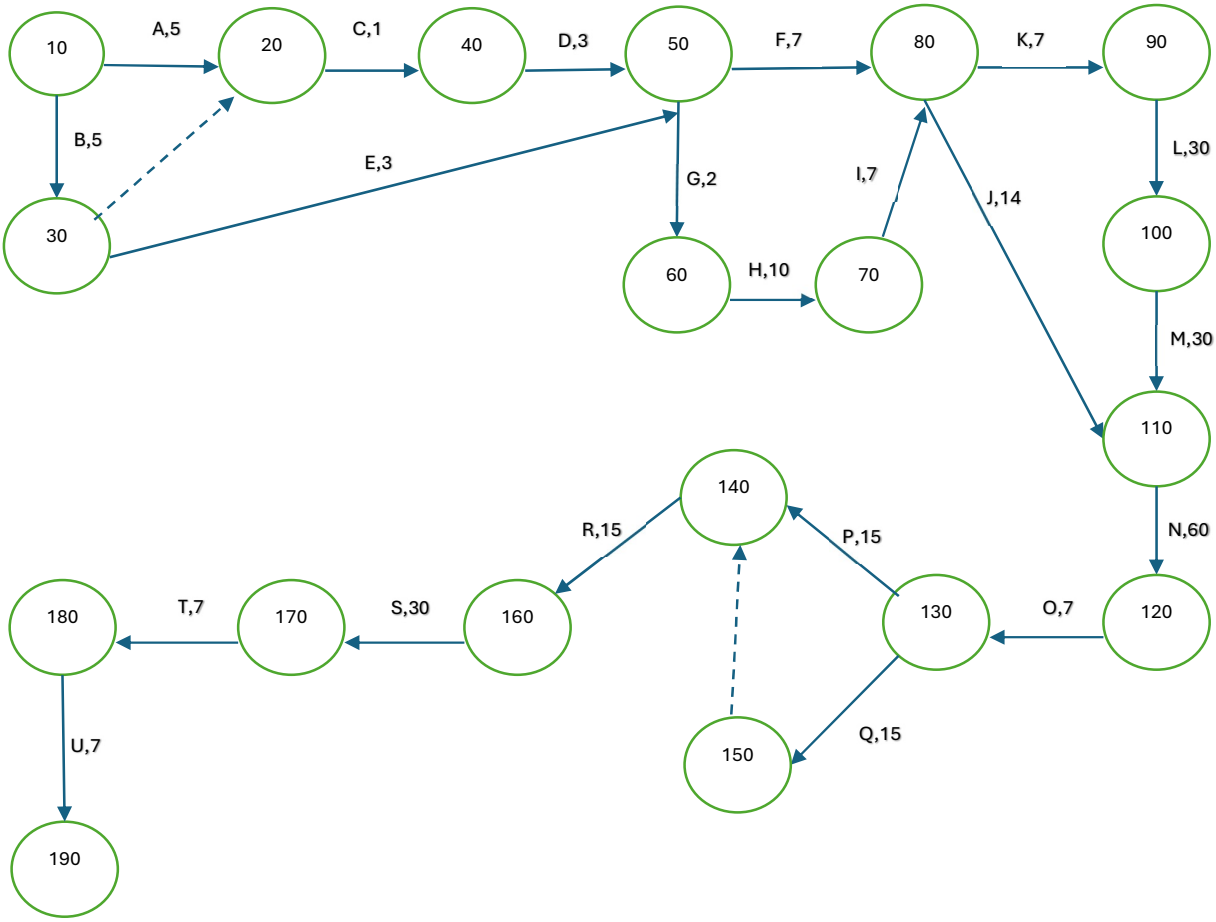
7.2 Work Breakdown Structure(WBS)

Activity		Predecessor	Duration(days)
Analysis phase			
A	Define system requirement	None	5
B	Identify project scope and objectives	None	5
C	Interview the expert	A,B	1
D	Conduct feasibility studies	C	3
E	Identify risks and constraints	B	3
Planning phase			
F	Develop project plan	D,E	7
G	Estimate cost and budget	D,E	2
H	Financial planning	G	10
I	Allocate resources	H	7
Design phase			
J	Create system architecture	F,I	14
K	Preliminary design	F,I	7
L	Detailed design	K	30
M	Prototype	L	30
Development phase			
N	Write code according to system architecture	J,M	60
Testing and debugging phase			
O	Develop testing plan	N	7
P	Execute functional testing	O	15
Q	Execute security testing	O	15
R	Address user feedback and identify bug	P,Q	15
S	Debugging	Q	30
Implementation phase			
T	Deploy system	S	7
Maintenance phase			
U	Perform updates and upgrades	T	7

7.2 Work breakdown structure(WBS)



7.3 PERT chart



All path:

Path 1:A-C-D-F-K-L-M-N-O-P-R-S-T-U

Length:5+1+3+7+7+30+30+60+7+15+15+30+7+7=217

Path 2:A-C-D-F-K-L-M-N-O-Q-R-S-T-U

Length: 5+1+3+7+7+30+30+60+7+15+15+30+7+7=217

Path 3:A-C-D-F-J-N-O-P-R-S-T-U

Length:5+1+3+7+14+60+7+15+15+30+30+7+7=171

Path 4:A-C-D-F-J-N-O-Q-R-S-T-U

Length: 5+1+3+7+14+60+7+15+15+30+7+7=171

Path 5:A-C-D-G-H-I-K-L-M-N-O-P-R-S-T-U

Length:5+1+3+2+10+7+7+30+30+60+7+15+15+30+7+7=236

Path 6:A-C-D-G-H-I-K-L-M-N-O-Q-R-S-T-U

Length: 5+1+3+2+10+7+7+30+30+60+7+15+15+30+7+7=236

Path 7:A-C-D-G-H-I-J-N-O-P-R-S-T-U

Length:5+1+3+2+10+7+14+60+7+15+15+30+7+7=183

Path 8:A-C-D-G-H-I-J-N-O-Q-R-S-T-U

Length: 5+1+3+2+10+7+14+60+7+15+15+30+7+7=183

Path 9:B-C-D-F-K-L-M-N-O-P-R-S-T-U

Length:5+1+3+7+7+30+30+60+7+15+15+30+7+7=224

Path 10:B-C-D-F-K-L-M-N-O-Q-R-S-T-U

Length: 5+1+3+7+7+30+30+60+7+15+15+30+7+7=224

Path 11:B-C-D-F-J-N-O-P-R-S-T-U

Length:5+1+3+7+14+60+7+15+15+30+7+7=171

Path 12: B-C-D-F-J-N-O-Q-R-S-T-U

Length: 5+1+3+7+14+60+7+15+15+30+7+7=171

Path 13:B-C-D-G-H-I-K-L-M-N-O-P-R-S-T-U

Length:5+1+3+2+10+7+7+30+30+60+7+15+15+30+7+7=236

Path 14:B-C-D-G-H-I-K-L-M-N-O-Q-R-S-T-U

Length: 5+1+3+2+10+7+7+30+30+60+7+15+15+30+7+7=236

Path 15:B-C-D-G-H-I-J-N-O-P-R-S-T-U

Length:5+1+3+2+10+7+14+60+7+15+15+30+7+7=183

Path 16:B-C-D-G-H-I-J-N-O-Q-R-S-T-U

Length: 5+1+3+2+10+7+14+60+7+15+15+30+7+7=183

Path 17:B-E-F-K-L-M-N-O-P-R-S-T-U

Length:5+3+7+7+30+30+60+7+15+15+30+7+7=223

Path 18:B-E-F-K-L-M-N-O-Q-R-S-T-U

Length: 5+3+7+7+30+30+60+7+15+15+30+7+7=223

Path 19:B-E-F-J-N-O-P-R-S-T-U

Length:5+3+7+14+60+7+15+15+30+7+7=170

Path 20: B-E-F-J-N-O-Q-R-S-T-U

Length: 5+3+7+14+60+7+15+15+30+7+7=170

Path 21:B-E-G-H-I-K-L-M-N-O-P-R-S-T-U

Length:5+3+2+10+7+7+30+30+60+7+15+15+30+7+7=235

Path 22: B-E-G-H-I-K-L-M-N-O-Q-R-S-T-U

Length: 5+3+2+10+7+7+30+30+60+7+15+15+30+7+7=235

Path 23:B-E-G-H-I-J-N-O-P-R-S-T-U

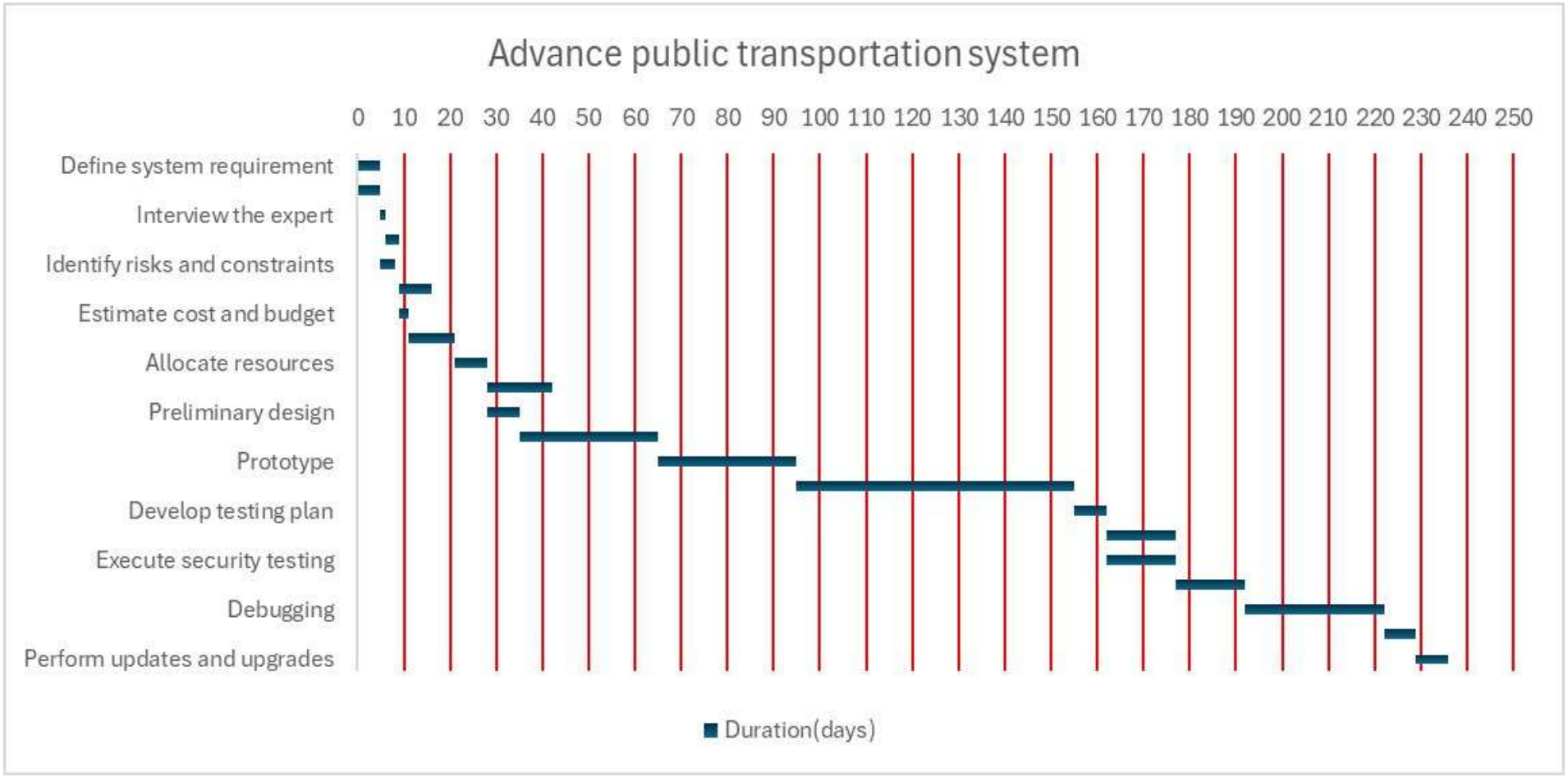
Length:5+3+2+10+7+14+60+7+15+15+30+7+7=182

Path 24: B-E-G-H-I-J-N-O-Q-R-S-T-U

Length: 5+3+2+10+7+14+60+7+15+15+30+7+7=182

Since the critical path is the longest path through the network diagram, Path 13 and Path 14 are the critical path for this Project.Their length is 236 days.

7.4 Gantt Chart



8.0 Benefit and Overall Summary of Proposed System

The primary goal of this project is to increase the convenience and efficiency of the prior system. As we all know, the existing approach is too conventional, as the driver and passengers still have to do it by hand. As a result, the procedure will slow down, and customers will undoubtedly be dissatisfied.Our solution will address all of the existing system's faults. With this goal in mind, we can design a system that meets all of our transportation requirements.

Keeping their demands, comfort, and system smoothness in mind, this suggested solution would allow users to be much more at ease and manage their time appropriately since they will be able to know the exact location of the bus with their fingertips. The proposed technology will notify passengers waiting at the bus stop with their bus number, destination, and drivers. As a result, because conventional systems provide less and ineffective functions.

The current transportation system is encountering significant issues due to drivers frequently skipping bus stops, resulting in extended waiting times for passengers. In response, our system has devised a solution by offering users the ability to reserve specific pickup points at designated bus stops. This feature informs the bus to stop at the predetermined bus stops, facilitating the collection of passengers who wish to board, thereby streamlining the process and enhancing overall efficiency.

The implementation of this system will effectively mitigate the complexities inherent in the current manual system. Utilising this advanced system promises an enhanced experience for both passengers and system developers. Passengers will find the service more enjoyable and efficient, while developers will experience a smoother operational process. Developing this system provides invaluable learning opportunities, especially for computer science students, exploring various features and the intricacies of database systems to store user information. The project aims to comprehensively tackle the existing issues within the transportation system, particularly the problem of drivers frequently skipping bus stops, leading to prolonged waiting times for passengers. In response, the project is implementing a cutting-edge transportation system.

Github

Github Project link: https://github.com/users/ZhuohengChew/projects/3

Github Project link: https://github.com/ZhuohengChew/Project1_SAD_20232024