



UTM
UNIVERSITI TEKNOLOGI MALAYSIA

SCHOOL OF COMPUTING
Faculty of Engineering

PHASE 1: PROJECT PROPOSAL

<Mr.Parker>

COURSE NAME : SECD2613 SYSTEM ANALYSIS AND DESIGN
SECTION : 08
TITLE : PROJECT PROPOSAL
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1.0 Introduction

The increasing number of cars these days has led to a surge in congested parking lots which causes a lot of problems for users. The main problems include long queues for payment, difficulty to find the empty parking space, Discrepancies of the display system, lack of parking lot signage and finally poor infrastructure in car parking lots. All these problems can take a huge portion of the time of the user causing them to be late, an article states that according to Boston Consulting Group (BCG) research, people in Kuala Lumpur spend 25 minutes every day searching for a parking spot (“TimeTec Smart Parking 12/12”, 2021). These inefficiencies not only inconvenience users but also impact parking businesses by deterring customers.

To address the above challenges, we propose a mobile application <Mr.Parker> that streamlines the parking experience. We will be employing a “first come first serve” approach which would solve the problem by assigning users the closest available parking spaces upon arrival. This eliminates wasted time searching and minimizes travel time within the lot, offering greater convenience and potentially easier maneuvering upon exiting. The app also has an auto-payment system and is equipped with GPS to guide the user inside the parking lot to exit easily. It also alerts the user in case of an emergency or safety issue.

2.0 Background study

Sutera Mall's car park currently employs a conventional management system, utilizing touch-and-go machines without displaying available parking spaces. The car park, encompassing both outdoor and indoor sectors, is expansive. However, the outdoor and indoor sectors are interconnected, leading to challenges for users, particularly during busy periods. The absence of sensor technology further exacerbates the difficulty for users in locating available parking spaces. These conclusions were drawn from interviews conducted regarding Sutera Mall's car park.

Interview of Sutera Mall's car park users:

User 1

Question	Answer
On a scale of 1 to 5, how would you rate your overall satisfaction with Sutera Mall's car park?	3
Can you describe your typical experience when trying to find a parking space at Sutera Mall?	It is difficult at times making me go around the whole parking lot.
Have you encountered any specific challenges or frustrations while navigating the car park, especially during busy times?	Yes it can get crowded since they have both the indoor and outdoor merged.
What do you think about the current touch-n-go system used for entry and exit in the car park?	It's frustrating that sometimes the touch-and-go scanning machine is not functioning and might cause some trouble for the user.
How do you feel about the absence of displays showing available parking spaces? Do you think it would be helpful to have such displays?	Yes, sometimes I enter and the parking lot is full. If there was a sign that displayed the empty spaces I would save much time.
How do you feel if there's a "first come first serve" parking system to assist with parking allocation and navigation?	I think it would make finding a spot much easier since it assigns empty spots.
How do you think the implementation of sensor technology could benefit users in	It can help in detecting when a car leaves making another spot empty.

finding parking spaces more easily?	
Would you be willing to switch to a mobile parking app for payment instead of the touch-and-go payment method?	If it is secure enough it would make life easier.

User 2

Question	Answer
On a scale of 1 to 5, how would you rate your overall satisfaction with Sutera Mall's car park?	1
Can you describe your typical experience when trying to find a parking space at Sutera Mall?	I always come and there are no parking spots. I just waste my time going around the parking lot.
Have you encountered any specific challenges or frustrations while navigating the car park, especially during busy times?	Yes, always. They need to fix their navigation system.
What do you think about the current touch-n-go system used for entry and exit in the car park?	It mostly works but when it stops working it can cause a long queue which is frustrating.
How do you feel about the absence of displays showing available parking spaces? Do you think it would be helpful to have such displays?	As I said earlier I always suffer from the parking lot being full. I think it is necessary for them to implement a sign for that.
How do you feel if there's a "first come first serve" parking system to assist with parking allocation and navigation?	That would be helpful instead of wasting time finding a spot.
How do you think the implementation of sensor technology could benefit users in finding parking spaces more easily?	It is necessary if they want to implement a sign with available parking spots.
Would you be willing to switch to a mobile parking app for payment instead of the touch-and-go payment method?	Yea as long as the process is not complicated.

3.0 Problem statement

1. Hard to find a parking space

With growing cities and more vehicles on the road, users will find it more difficult to find a parking space. If the parking lot does not keep up with the demands of the growing population, users may face a lot of trouble finding a parking space. For example, one of the users in Sutera Mall parking lot wastes a lot of time just to find a parking spot to park during peak hours. Due to this situation, some users will choose to park illegally such as double parking and it might cause inconvenience to other users. User satisfaction will be reduced due to this reason.

2. Long queue for payment

Long queues at the payment counter is one of the problems faced by users nowadays. Sutera Mall car park is using the cashless parking system. Parking lot users need to queue up at the cashless autopay machine to make payment by card when they need to exit the parking lot. The queue length depends on the volume of visitors on that particular day. The situation will be worse if some of the autopay machines breakdown and there is a lack of autopay machines. Besides, a user having issues with the cashless autopay system in the shopping mall is a problem that happens almost every day. The user had to seek help from the staff on duty and wait for the staff to solve their problem. The process can result in additional cost and the user needs to spend a lot of time just to exit the parking lot.

3. Discrepancies of the display system

Occasionally, the display of parking space availability in Sutera Mall car park is one of the most annoying problems for users. For example, user 1 saw the display showing that there was 1 car park space at the basement level of the car park, he drove all along from the upper floor to the basement and found out that it was just the mistake of the sensor and there was no empty car park space. This problem has tremendously wasted user's time and also increased the carbon footprint, which is not user-friendly.

4. Lack of parking lot sign

Parking lot signage plays a crucial role in parking lots to ensure users not to get lost in the parking lot. The problem usually faced by the user in Sutera Mall car park is the signage does not mark the direction clearly and the user could not find the way out of the parking lot, which causes the user to spend more time and car fuel to find the correct direction. Some of the parking lots do not clearly mark the sign of speed limit in the parking lot, the direction of traffic flow and pedestrian crossing, it can confuse the driver and increase the risks of accidents and collisions in the car park.

5. Poor infrastructure in car park

A parking lot with poor facilities can cause tons of troubles. For example, Sutera Mall car park with inadequate lighting and lack of security cameras can create safety concerns especially during night time, it can increase the rate of accidents and criminal activities such as robbery. A parking lot without security measures will increase crime risk and decrease user experience.

4.0 Proposed solution

Mr.Parker is a new system solution we propose and introduce to improve the car park system in Sutera Mall Parking lot. The system provides more convenience to users compared to the old system which can enhance satisfaction of users and attract more users. The system implements a sensor-based system which can identify the empty slots in the parking lots efficiently. Other than that, the improvement of the cashless autopay machine reduces the failure rate and can speed up the enter and exit processes and increase parking turnover rate.

In the new system, it allows users to check the availability of parking slots in every level of Sutera Mall parking lot and users can choose to prebook the parking spot via our new carpark application system. The application included a GPS navigation system to navigate the user to an allocated car park location. Users may choose the date and time from the mobile application and the staff will put a reservation sign 15 minutes before the time booked. Reservation sign will be removed after 15 minutes of the booking time, users may choose to extend the reservation time via application but it will cost extra charges. The application also enables users to make feedback about the car park which can actually help stakeholders to identify the issues faced by users. As an example, the user can comment that the car park is too dark so that the stakeholder of Sutera Mall can make improvements on lightning based on this comment.

When using the old system, users can only pay the carpark fee through the cashless auto pay machines in the car park which can cause traffic jams during peak hours because users cannot pay in advance. By using the new system, users can choose to pay via application and exit the parking lot faster. Mr.Parker introduced the new machine system which can determine the number plate and the barrier will be opened in a few seconds after the system verifies the parking fee has been accepted in the system before the user checks out. Moreover, users can have real-time supervision of the car park, safety and emergencies will be updated to the users through the application. Users can also make a report via the application if they saw someone suspicious. The user that makes a helpful report will be given a parking voucher. However, continuous spam reports will be given a penalty.

Furthermore, the staff working in the parking lots will be more at ease using the new system. More real-time cameras and monitors are installed in the security room, they can check every area attentively and work easier. They can review user comments using the application system and check the issue places effectively.

In addition, Mr.Parker also offers many benefits to the stakeholder of Sutera Mall car park management. With the implementation of the new system, the turnover rate increase helps stakeholders to earn more revenue. Besides, the improvement of the security system improves the public image of the stakeholders, so users will feel secure when using the parking lot. The stakeholder also might get more new business with a good public image.

Technical feasibility

MrParker conducts an application that can be accessed on most electrical communication devices such as mobile phone, laptop, PC and smartwatch. The system needs a strong database system to store every information in the car park and reservation details. Other than that, Mr Parker needs a booking system to allow the user view and reserve parking slots available for specific dates and time. Last but not least, the API connection is needed to provide a real-time situation in the car park to the users and stakeholders.

Operational feasibility

The Mr.Parker system is easy to use and understood by users and it does not have a negative impact on existing systems. The system is easy to maintain and repair with the support of the information system.

Economic feasibility (CBA)

Assumptions	
Discount rate	10%
Sensitivity factor(costs)	1.1
Sensitivity factor (benefits)	0.9
Annual change in production costs	5%
Annual change in benefits	7%

Estimated costs	
Hardware	RM 20,000
Software development	RM 15,000
Maintenance	RM 4000 per year
IS Support	RM 18,000 per year
IoT tool expenses	RM 30,000

Estimated benefits	
Increase sales	RM 50,000
Savings	RM 10,000

Cost	Year 0	Year 1	Year 2	Year 3
Development costs - hardware - software - IoT tools expenses	RM 22,000 RM 16,500 RM 33,000			
TOTAL	RM 38,500			
Production costs - maintenance - IS Support		RM 4,400 RM 19,800	RM 4,620 RM 20,790	RM 4,851 RM 21,829
Annual Production costs (present value)		RM 24,200 RM 22,000	RM 25,410 RM 21,000	RM 26,680 RM 20,045
ACCUMULATED COSTS		RM 60,500	RM 81,500	RM 101,545
Benefits				
Increased sales Savings		RM 45,000 RM 9,000	RM 48,150 RM 9,630	RM 51,520 RM 10,304
Annual benefits (present value)		RM 54,000 RM 49,090	RM 57,780 RM 47,752	RM 61,824 RM 46,449
ACCUMULATED BENEFITS		RM 49,090	RM 96,842	RM 143,291
Gain or loss		(RM 11,410)	RM 15,342	RM 41,746
Profitability index	1.08			

5.0 Objectives

- (i) To provide the car park user with an efficient and time-saving experience
- (ii) To reduce the maintenance burden of the Car Park system
- (iii) To propose the “first come first serve” parking system
- (iv) To integrate an auto payment system rather than a manual payment system
- (v) To provide displays and navigation for the user regarding the available parking spaces.
- (vi) To leverage the car park management system by integrating computerized features.

6.0 Scope of the project

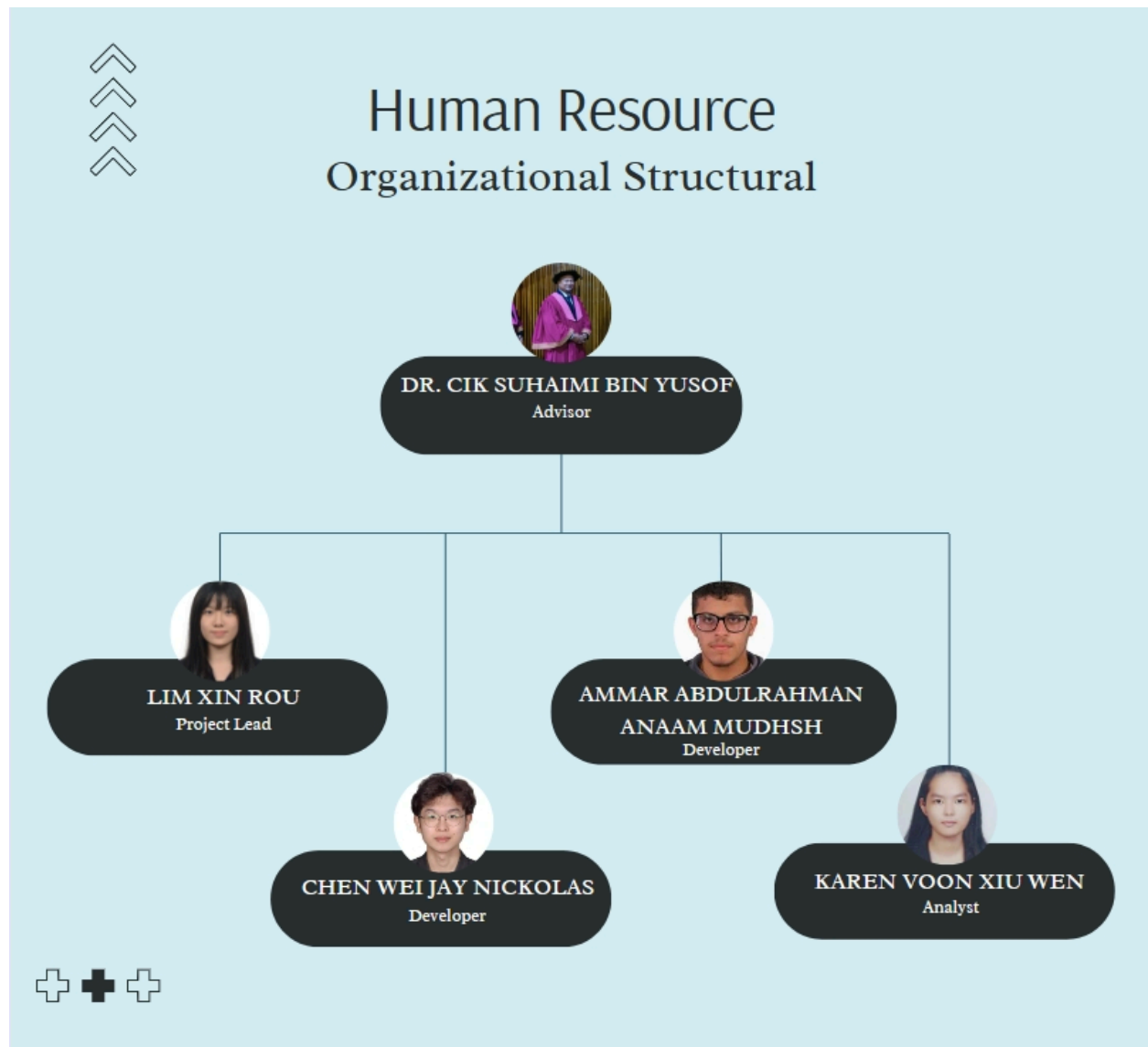
The proposed system is designed to enhance the overall experience of users in the car park. For example, we will implement a "first come first serve" system that allocates empty parking spaces in order of arrival, integrating a mobile application and IoT technology. Users will need to install the exclusive mobile application and register an account for access. Payment will be fully processed through the application, eliminating the malfunctioning of the touch-n-go machine. Two parties will utilize this system: the car park owner and the user.

For the car park owner, this system will provide real-time occupancy data, enabling better management and optimization of parking spaces. The owner can oversee the safety and data of the car park through the application, which is integrated with IoT technology for real-time updates and emergency notifications. Streamlining the payment process reduces the need for manual intervention and increases revenue by improving space utilization efficiency.

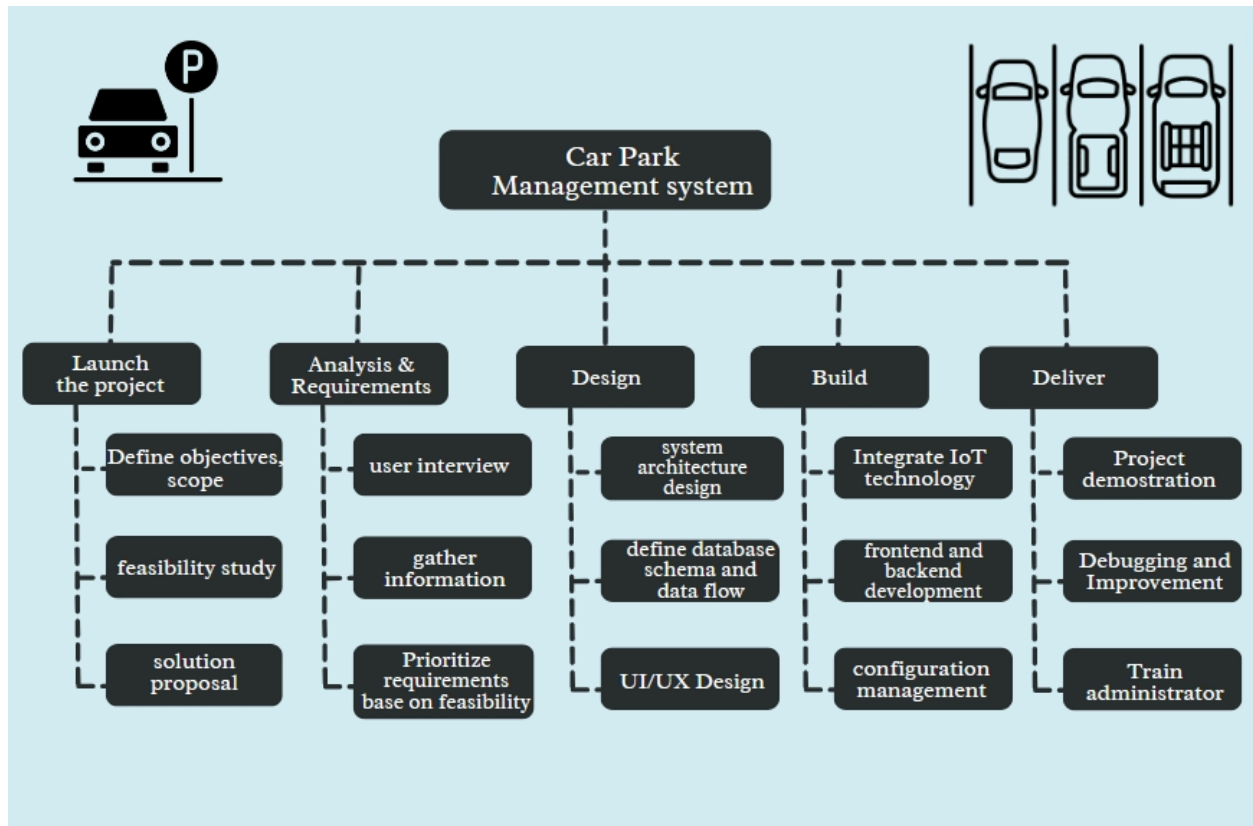
For users, the system offers convenience and efficiency. Firstly, users can find available parking spaces more quickly through the allocation system. The system will inform users of the exact location of their allocated parking space, and a GPS directory will be included to prevent users from getting lost in large car park centers. This helps reduce the time spent searching for a spot. The "first come first serve" system ensures fairness in space allocation, eliminating the need to circle the car park looking for an open spot. Additionally, the automated payment system simplifies the process, making it seamless and hassle-free. Once users park at their allocated space, the system will begin calculating the parking time until they leave the car park. Bills will be displayed on the application, and payments can be made online.

7.0 Project planning

7.1 Human Resource



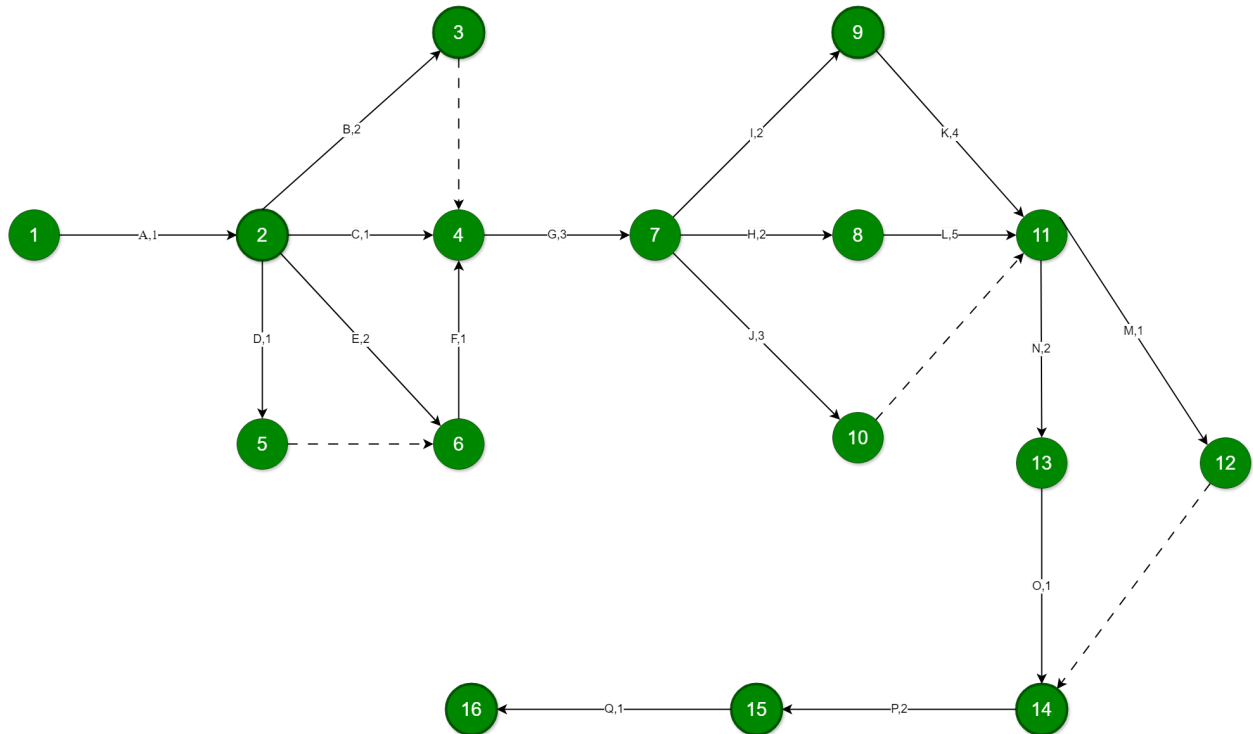
7.2 Work Breakdown Structure (WBS)



7.3 PERT Chart (based on WBS)

Activities		Predecessors	Duration (Weeks)
A	Define Project Objectives	-	1
B	Feasibility Study	A	2
C	Solution Proposal	A	1
D	User Interviews	A	1
E	Gather Information	A	2
F	Prioritize Requirements	E	1
G	System Architecture Design	C, F	3
H	Define Database Schema & Dataflow	G	2
I	UI/UX Design	G	2
J	Integrate IoT Technology	G	3
K	Frontend Development	I	4
L	Backend Development	H	5
M	Configuration Management	K, L	1
N	Unit Testing	K, L	2
O	Project Demonstration	N	1

P	Debugging & Improvement	O	2
Q	Train Administrator	P	1



Path 1: A -> C -> G -> H -> L -> N -> O -> P -> Q

Length: $1 + 1 + 3 + 2 + 5 + 2 + 1 + 2 + 1 = 18$

Path 2: A -> C -> G -> H -> L -> M -> P -> Q

Length: $1 + 1 + 3 + 2 + 5 + 1 + 2 + 1 = 16$

Path 3: A -> C -> G -> I -> K -> N -> O -> P -> Q

Length: $1 + 1 + 3 + 2 + 4 + 2 + 1 + 2 + 1 = 17$

Path 4: A -> C -> G -> I -> K -> M -> P -> Q

Length: $1 + 1 + 3 + 2 + 4 + 1 + 2 + 1 = 15$

Path 5: A -> C -> G -> J -> N -> O -> P -> Q

Length: $1 + 1 + 3 + 3 + 2 + 1 + 2 + 1 = 14$

Path 6: A -> C -> G -> J -> M -> P -> Q

Length: $1 + 1 + 3 + 3 + 1 + 2 + 1 = 12$

Path 7: A -> B -> G -> H -> L -> N -> O -> P -> Q

Length: $1 + 2 + 3 + 2 + 5 + 2 + 1 + 2 + 1 = 19$

Path 8: A -> B -> G -> H -> L -> M -> P -> Q

Length: $1 + 2 + 3 + 2 + 5 + 1 + 2 + 1 = 17$

Path 9: A -> B -> G -> I -> K -> N -> O -> P -> Q

Length: $1 + 2 + 3 + 2 + 4 + 2 + 1 + 2 + 1 = 18$

Path 10: A -> B -> G -> I -> K -> M -> P -> Q

Length: $1 + 2 + 3 + 2 + 4 + 1 + 2 + 1 = 16$

Path 11: A -> B -> G -> J -> N -> O -> P -> Q

Length: $1 + 2 + 3 + 3 + 2 + 1 + 2 + 1 = 15$

Path 12: A -> B -> G -> J -> M -> P -> Q

Length: $1 + 2 + 3 + 3 + 1 + 2 + 1 = 13$

Path 13: A -> E -> F -> G -> H -> L -> N -> O -> P -> Q

Length: $1 + 2 + 1 + 3 + 2 + 5 + 2 + 1 + 2 + 1 = 20$

Path 14: A -> E -> F -> G -> H -> L -> M -> P -> Q

Length: $1 + 2 + 1 + 3 + 2 + 5 + 1 + 2 + 1 = 18$

Path 15: A -> E -> F -> G -> I -> K -> N -> O -> P -> Q

Length: $1 + 2 + 1 + 3 + 2 + 4 + 2 + 1 + 2 + 1 = 19$

Path 16: A -> E -> F -> G -> I -> K -> M -> P -> Q

Length: $1 + 2 + 1 + 3 + 2 + 4 + 1 + 2 + 1 = 17$

Path 17: A -> E -> F -> G -> J -> N -> O -> P -> Q

Length: $1 + 2 + 1 + 3 + 3 + 2 + 1 + 2 + 1 = 16$

Path 18: A -> E -> F -> G -> J -> M -> P -> Q

Length: $1 + 2 + 1 + 3 + 3 + 1 + 2 + 1 = 14$

Path 19: A -> D -> F -> G -> H -> L -> N -> O -> P -> Q

Length: $1 + 1 + 1 + 3 + 2 + 5 + 2 + 1 + 2 + 1 = 19$

Path 20: A -> D -> F -> G -> H -> L -> M -> P -> Q

Length: $1 + 1 + 1 + 3 + 2 + 5 + 1 + 2 + 1 = 17$

Path 21: A -> D -> F -> G -> I -> K -> N -> O -> P -> Q

Length: $1 + 1 + 1 + 3 + 2 + 4 + 2 + 1 + 2 + 1 = 18$

Path 22: A -> D -> F -> G -> I -> K -> M -> P -> Q

Length: $1 + 1 + 1 + 3 + 2 + 4 + 1 + 2 + 1 = 16$

Path 23: A -> D -> F -> G -> J -> N -> O -> P -> Q

Length: $1 + 1 + 1 + 3 + 3 + 2 + 1 + 2 + 1 = 15$

Path 24: A -> D -> F -> G -> J -> M -> P -> Q

Length: $1 + 1 + 1 + 3 + 3 + 1 + 2 + 1 = 13$

The critical path is the path with the largest length which is path 13:

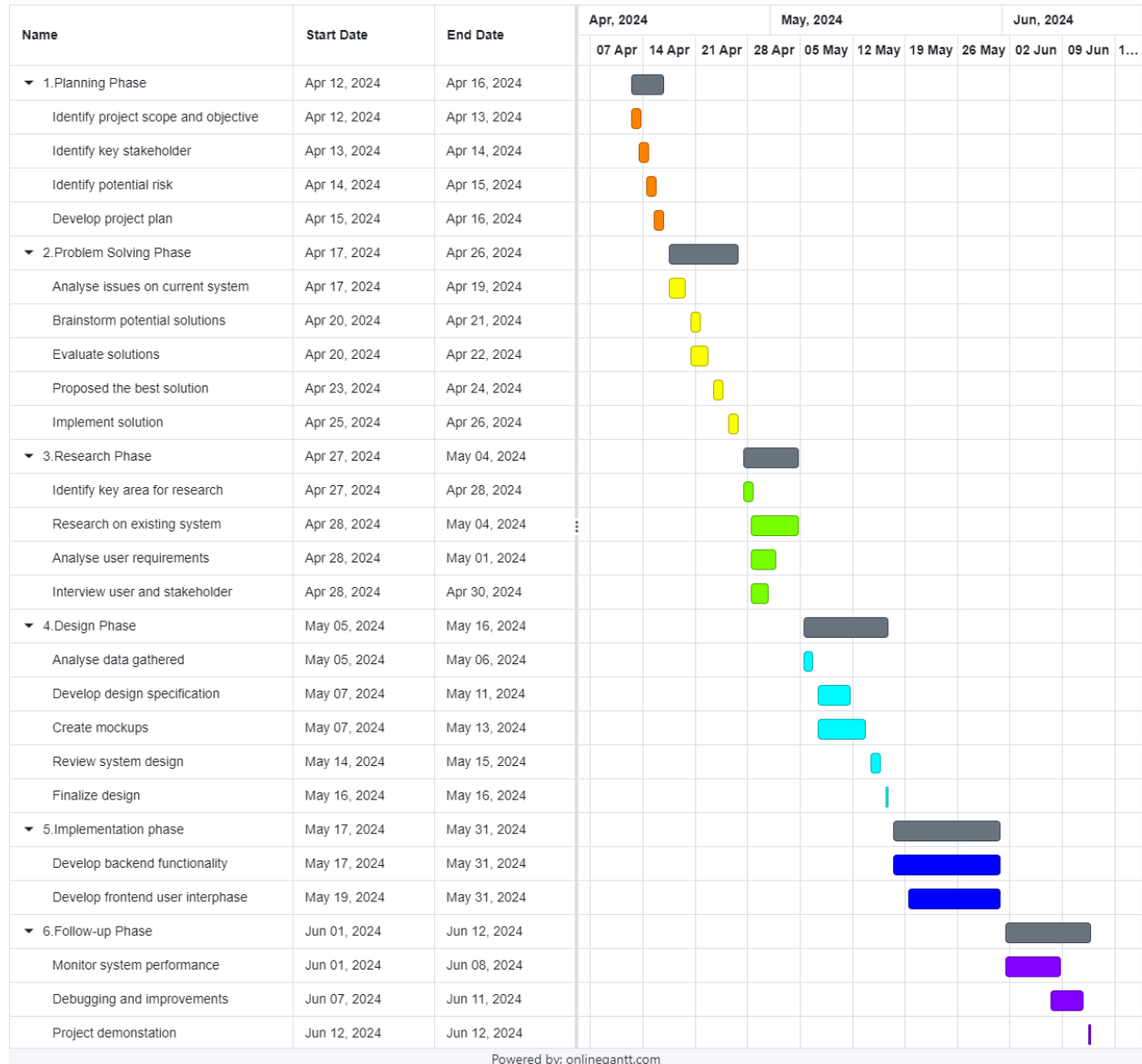
Critical Path: A -> E -> F -> G -> H -> L -> N -> O -> P -> Q

Length: $1 + 2 + 1 + 3 + 2 + 5 + 2 + 1 + 2 + 1 = 20$

7.4 Gantt Chart

Project start: 12 Apr 2024

Display week: 1



Tool: <https://www.onlinegantt.com/>

8.0 Benefit and Overall Summary of Proposed System

There are a lot of benefits to using our car park management system.

First of all, Users can easily find a slot when they enter the parking lot, users are allocated parking slots in a fair and order based on a first come first serve basis, which also avoid conflict in getting a parking lot. Additionally, The car park management system improves efficiency by automating processes such as car plate scanning and IoT integration for the parking process.

Besides, the system will automatically calculate the parking fee once the user enters their parking slot and the leave time, reducing their wait time. Moreover, the system's mobile app integration and online payment feature provide users with convenience, allowing them to easily find parking and make payments, eliminating the need for physical tickets and cash payments. The system also provides safety functions for the user such as real-time updates and emergency notifications.

Overview of the proposed car park management system, it makes everything easier. With the app, users can find parking, pay online, and keep track of their car. It also saves time by automatically assigning parking spots when users arrive. Our new parking system will change how we manage parking using technology to improve efficiency, fairness, and user experience. In summary, the new parking system has a lot of benefits and will make a big difference compared to the traditional parking system.

Reference

- TimeTec. (2021, September 22). TimeTec Smart Parking 12/12: Integrated Parking Guidance System. *Malaysiakini*.

www.malaysiakini.com/announcement/592372

Github:

Repository Link: https://github.com/xr-lim/Group4_Project1_SAD_20232024

Repository screenshots:

README.md

Update README.md

2 minutes ago

README

Group4_Project1_SAD_20232024

Description

The increasing number of cars these days has led to a surge in congested parking lots which causes a lot of problems for the users. The main problems include long queues for payment, difficulty to find the empty parking space, Discrepancies of the display system, lack of parking lot signage and finally poor infrastructure in car parking lots. All these problems can take a huge portion of the time of the user causing them to be late, an article states that according to Boston Consulting Group (BCG) research, people in Kuala Lumpur spend 25 minutes every day searching for a parking spot ("TimeTec Smart Parking 12/12", 2021). These inefficiencies not only inconveniences users but also impact parking businesses by deterring customers. To address the above challenges, we propose a mobile application that streamlines the parking experience. We will be using a "first come first serve" approach which would solve the problem by assigning users the closest available parking spaces upon arrival. This eliminates wasted time searching and minimizes travel time within the lot, offering greater convenience and potentially easier maneuvering upon exiting. The app also has an auto-payment system and is equipped with GPS to guide the user inside the parking lot to easily exit it also alerts the user in case of an emergency or safety issue.

Readme

Activity

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README

Our team 🏃

Name	Matric Number	Photo
Lim Xin Rou	A23CS0240	
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Ammar Abdulrahman Anaam Mudhsh	A23CS0287	
Karen Voon Xiu Wen	A23CS0229	

Phase 1: Project proposal and planning

- kanban board link : <https://github.com/users/xr-lim/projects/1/views/1>
- report link :

Kanban board link: <https://github.com/users/xr-lim/projects/1/views/1>

Group4_SAD_Project Add status update ☑ ☰ ⋮

📅 Backlog 📅 Priority board 📅 Team items 📅 Roadmap 📅 In review 📅 My items + New view

Filter by keyword or by field Discard Save

To-do 0 Estimate: 0

This is ready to be picked up

+ Add item

In progress 2 / 3 Estimate: 0

This is actively being worked on

Group4_Project1_SAD_20232024 #3
conduct background study

Group4_Project1_SAD_20232024 #7
List proposed solutions

+ Add item

In review 2 / 5 Estimate: 0

This item is in review

Group4_Project1_SAD_20232024 #9
Gantt Chart

Group4_Project1_SAD_20232024 #10
PERT Chart

+ Add item

Done 8 Estimate: 0

This has been completed

Group4_Project1_SAD_20232024 #6
objectives of project

Group4_Project1_SAD_20232024 #5
scope of project

Group4_Project1_SAD_20232024 #11
Work Breakdown Structure (WBS)

Group4_Project1_SAD_20232024 #12
List Human Resource

Group4_Project1_SAD_20232024 #13

+ Add item

Version Control Practices:

Version control practices are vital in bringing a project to success using Github. This is because it helps to keep track of changes and work together smoothly.

- Feature branching: means creating separate branches for new features or changes. This keeps the main code safe while group members are working on something new.
- Pulling requests: means asking permission to merge changes into the main code. It lets others review the work before it becomes permanent.
- Code reviews: a collaborative process where one or more developers examine another developer's code to identify issues, offer feedback, and ensure it meets quality standards before it's integrated into the main codebase.