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Shopping Mall Motorcycle Parking Lot Mobile Application: An Alternative Parking Payment Method

Ooi Kean Hong[1], Usha Jayahkudy[2]
INTI International College Penang, Malaysia[1,2]
Corresponding Author: ooikeanhong168@gmail.com
ORCID ID: 0009-0002-7195-850X

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ABSTRACT

The purpose of this study is to address the current payment method for shopping mall motorcycle parking lot in Penang, Malaysia. The study aims to provide a shopping mall motorcycle parking mobile application for motorcyclists to pay the parking fee at shopping mall motorcycle parking lot in Penang Island which is commonly available at one designated location such as in the basement level or outdoor area. The project methodology used for this project is Rapid Application Development (RAD), which incorporates a prototyping approach enabling developers to implement valuable feedback before finalizing the product. This study results in M A R C as a shopping mall motorcycle parking lot mobile application that is the proposed solution that provides an alternative payment method for motorcyclists by introducing a payment method for motorcyclists through the mobile application. The mobile application was developed to provide additional information about the shopping mall motorcycle parking lot. Hence, the mobile application developed using Flutter should ease the payment process with the new alternative mobile application payment method and provide motorcyclists with the necessary information regarding the selected shopping mall motorcycle parking lot in Penang Island.

Keywords: Cashless Payment; Mobile Application; Motorcycle Parking Lot; Parking Fee; Payment Method

INTRODUCTION

Motorcycle has been a popular mode of transportation in Malaysia as it is affordable for common citizens and suitable to be used daily. Parking is one of the facilities provided by a place/factory/company to accommodate vehicles carried by visitors and employees (Willis & Sembiring, 2021). The shopping mall motorcycle parking lot in Penang usually only accepts Touch 'n Go (TNG) card payment method. Using the TNG frequently requires motorcyclists to ensure that it has sufficient funds. If the motorcyclist does not have sufficient balance in their TNG card to pay the parking fee to enter the shopping mall motorcycle parking lot, it is impossible to enter. There is usually no nearby location that provides TNG reload service near the shopping mall motorcycle parking lot. Hence, the motorcyclist could only travel to a location to reload their TNG card or park their motorcycle illegally. Illegal parking activity is the act of drivers parking vehicles in an illegal or restricted area, where signs are posted, in crosswalks, on sidewalks, or blocking traffic lanes as dictated by area traffic laws (Truong & Ngoc, 2020). Illegal parking is unbeneficial to the vehicle owner as it increases the possibility of receiving summons from the law enforcer or getting their vehicle clamped or towed. In addition, it disrupts the traffic flow with vehicles blocking the road by illegally parking on an undesignated area.

In Vietnamese cities and other motorcycle-dominated cities in Asia, the extremely high volume of motorcycle, increasing number of private cars, inefficient parking supply, inadequate public transport system, and immature driver's behaviour are contributing to the problem of illegal parking laws (Truong & Ngoc, 2020). The inefficient parking supply of motorcycle parking in shopping mall motorcycle parking lot during certain festive seasons causes several issues to motorcyclists. Currently, the only method to identify whether there are empty spaces in the shopping mall motorcycle parking lot is to be physically present in the shopping mall motorcycle parking lot after completing the payment to enter the shopping mall motorcycle parking lot with a TNG card. There is usually no indicator to indicate the current capacity of the shopping mall motorcycle parking lot. In an unfortunate event where the motorcyclist is unable to find an empty parking space after entering the shopping mall motorcycle parking lot, the motorcyclist can choose to park illegally in an undesignated area or exit the shopping mall motorcycle parking lot without parking in the shopping mall motorcycle parking lot after paying the parking fee. In addition, it is possible for the shopping mall motorcycle parking lot to be closed for maintenance or enhancement reasons. Getting information about the shopping mall motorcycle parking lot could help motorcyclists to prepare their trip to the shopping mall better and avoid disappointment.

This study aims to develop a mobile application for motorcycle parking payment at shopping malls in Penang, Malaysia, addressing current payment methods. The significance lies in providing motorcyclists with a convenient solution for paying parking fees, enhancing their parking experience, and streamlining the payment process at shopping mall motorcycle parking lots.

LITERATURE REVIEW

Paying to enter the shopping mall motorcycle parking lot is applicable in most shopping malls. This could be due to the evolution of the shopping mall car parking lot, which began requiring payment to be made by visitors parking their car in the shopping mall car parking lot. Unlike paying based on an entry fee and hours parked in the shopping mall car parking lot, shopping mall motorcycle parking lot charges solely on an entry fee. In Penang Island, shopping malls used to charge reasonable motorcycle parking lot

payment fee which ranged from RM 0.50 to RM 1.20 per entry. The only inconvenience of the cash payment method is the need to carry coins and notes as most of the payment machines only accept the exact amount for the parking fee. Inserting an insufficient or excessive amount will not unlock the parking barrier denying the motorcyclist from entering the shopping mall motorcycle parking lot. Hence, motorcyclists need to ensure that they have sufficient coins and notes for the parking fee as there are usually no machines or services provided nearby to exchange or withdraw money.

Before cashless payments were popularized in recent years, paying with cash was the preferred option. Cash is available free of charge, and its benefits include anonymity, easy verifiability, and widespread acceptance (McAndrews, 2020). However, with cashless payment options being implemented in recent years through banking mobile applications and e-wallet mobile applications such as Maybank2u MY, HLB Connect Mobile Banking App, Touch ‘n Go (TNG) eWallet, and Boost App Malaysia, the number of cashless payments has increased. Cashless payment is a behavioral change in the consumer in which consumers could reduce the usage of money as a medium of exchange for goods and services by allowing electronic transfer payments such as digital cash and e-wallet (Ishak, 2020; Nada et al., 2021; Kee et al., 2022a). Currently, the commonly used cashless payment method to pay for the parking fee of the shopping mall motorcycle parking lot is by using TNG card. TNG e-Wallet, favored and recommended by local residents, has gained increasing popularity as a preferred choice for daily transactions, particularly for parking and toll payments (Kee et al., 2022b). A TNG card is a reusable contactless stored-value smartcard that you can use for cashless payments at all toll highways in Peninsular Malaysia, public transport, and over 600 parking sites across Peninsular Malaysia. To use the TNG card, ensure you have sufficient balance and tap your TNG card at the TNG card reader (Touch ‘n Go Sdn Bhd, 2021a)

Similarly, the evolution from cash to cashless payment method for most shopping mall motorcycle parking lots could be due to the successful implementation of the cashless payment method for the shopping mall car parking lot. In Penang Island, the entry fee to the shopping mall motorcycle parking lot using cashless payment method ranged from RM 1.00 to RM 1.20 per entry. Figure 1 shows a shopping mall in Penang Island, Queensbay Mall promoting cashless payment method during the beginning of implementing cashless payments in the year 2019. Although it is clear that TNG card is the preferred payment method accepted by shopping mall motorcycle parking lot provider as TNG card payment is the only payment method for popular shopping mall in Penang Island such as Gurney Plaza, Gurney Paragon, Prangin Mall, and Queensbay Mall. Figure 2 shows the shopping mall motorcycle parking lot payment machine at Gurney Plaza, Gurney Paragon, Prangin Mall, and Queensbay Mall.

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Figure 1. Queensbay Mall Cashless Parking

Source: Queensbay Mall (2019b)

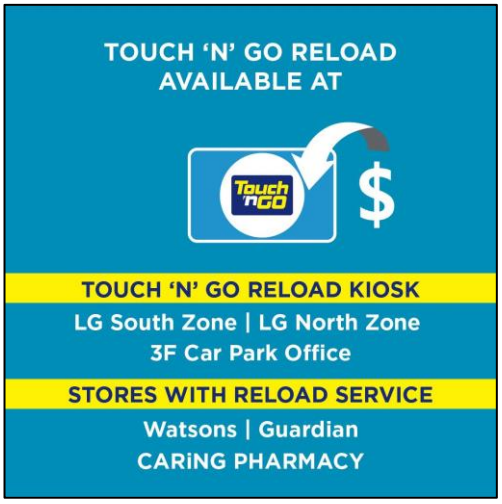
Figure 2. Shopping Mall Motorcycle Parking Lot Payment Machine

Gurney Plaza | Gurney Paragon | Prangin Mall | Queensbay Mall

The shopping mall motorcycle parking lot payment machine at Gurney Plaza, Gurney Paragon, and Queensbay Mall are similar except for the payment machine at Prangin Mall which accepts two additional payment methods: credit or debit card and dynamic QR code. The two additional payment methods ease motorcyclists by providing alternative options to make payment when there is insufficient balance in the TNG card. As stated on TNG official website, you can reload your TNG card at over 14,000 reload touchpoints across Peninsular Malaysia (Touch 'n Go Sdn Bhd., 2021c). The TNG card could only be reloaded at reload touchpoints which is ironically not available near to any shopping mall motorcycle parking lot payment machine and mostly is located in the shopping mall. Figure 3 shows the locations of the reload touchpoints provided at Queensbay Mall. The listed locations are inside the shopping mall that is only accessible

after the motorcyclists have parked their motorcycle. Hence, motorcyclists need to ensure that their TNG card have sufficient balance before arriving at the shopping mall motorcycle parking lot as it is impossible to reload the TNG card there. However, the enhanced TNG card with Near Field Communication (NFC) technology allows reload to be made easily through a smartphone. The enhanced TNG card is fully equipped with NFC technology to enable reloads via TNG eWallet, allowing you convenient and easy reloads wherever you are, whenever you want (Touch 'n Go Sdn Bhd., 2021c).

Figure 3. Queensbay Mall Touch 'n Go Reload Kiosk Locations



Source: Queensbay Mall (2019a)

A credit card uses money from a credit line – when the bank pays the shop first, then you pay the bank later while a debit card deducts from money currently existing in your bank account (Visa, n.d.). Most adults in the modern world own a bank account and therefore own a debit card or credit card. Paying with a credit or debit card eliminates the need to reload the TNG card at reload touchpoints as payment for the shopping mall motorcycle parking lot fee will be deducted from the bank account. However, there are some individuals such as young adults or students who do not own a bank account but are motorcyclists. Hence, making payment using the TNG card is more suitable as a TNG card can be purchased easily. You can purchase your TNG card from selected petrol stations, convenience stores, and self-service kiosks (Touch 'n Go Sdn Bhd., 2021b). The easy access to TNG card could be one of the reasons being the preferred payment method accepted at shopping mall motorcycle parking lot.

Dynamic QR code is based on the traditional QR code in a period of time multi-frame QR code image alternate display, each frame of QR code image data is generated by different key dynamic encryption, not easy to forge and not easy to crack (Baidong & Yukun, 2019). This payment method is a type of mobile payment method which utilizes smartphones which are owned by most adults in the modern world. The dynamic QR code is generated from banking mobile applications or e-wallet mobile applications such as Maybank2u MY, HLB Connect Mobile Banking App, TNG eWallet, and Boost App Malaysia. Figure 4 shows an example of dynamic QR code generated from MAE by Maybank 2u mobile application. Hence, there is a minimum age limit to register an account to use the mobile applications listed above. The process is similar to paying with a credit or debit card with the difference in the medium used, a physical card for credit or debit card payment and a smartphone for dynamic QR code payment. A study conducted to identify the effect of credit card versus mobile payment on convenience and consumers' willingness to pay proposed that the pain of paying using mobile payment is equal to that of using a credit card as all mobile payments are charged through existing

credit or debit cards and, therefore are financially equivalent to them (e.g., in terms of settlement time) (Boden et al., 2020). To use the e-wallet mobile application, users need to reload the e-wallet which can be completed using funds from the bank account or cash at reload touchpoints such as convenience stores.

Figure 4. MAE by Maybank2u Dynamic QR Code

Table 1. Features Comparison between UK Motorcycle Parking, London Bike Bays, and Penang Smart Parking

Features	UK Motorcycle Parking	London Bike Bays	Penang Smart Parking
Search Parking	✓	✓	✓
Register Parking	✓	✓	
Integrated Map	✓	✓	✓
Create Account		✓	✓
Parking Coordinates		✓	
Parking Information	✓	✓	
Navigation		✓	✓
Subscription		✓	✓
Social		✓	
E-Wallet			✓
Pay Parking			✓
View History			✓
Register Vehicle			✓
View Message			✓
View Promotions			✓
Transfer Credits			✓

Table 1 shows the selected features from the reviewed parking mobile application which is suitable to be implemented for the shopping mall motorcycle parking lot mobile application. UK Motorcycle Parking and London Bike Bays have similar functionalities

and target audiences. The differences are London Bike Bays displayed more information about motorcycle parking in London while UK Motorcycle Parking provide motorcycle parking information surrounding the whole of United Kingdom (UK). Penang Smart Parking only provides parking information mainly for four-wheel vehicles in Penang and does not cater for motorcycle parking. UK Motorcycle Parking and London Bike Bays allow users to register new motorcycle parking while this feature is not available in Penang Smart Parking as sensors are installed on the ground at the car parking lot which operates with Penang Smart Parking mobile application. Hence, the team at Penang Smart Parking will determine which car parking lot is suitable to be implemented to operate with Penang Smart Parking mobile application. UK Motorcycle Parking does not require users to create an account while both London Bike Bays and Penang Smart Parking require users to create an account to use the mobile application.

With an account for the respective mobile application, users can search and register parking, access the parking coordinates, information, and navigation feature of London Bike Bays and search for parking, access navigation feature, utilize the e-wallet feature to pay for the parking fee, view transaction history, view notifications and identify current promotions of Penang Smart Parking. The features of the free-to-use version of London Bike Bays is limited but sufficient. The paid version which can be subscribed annually at a relatively low fee, comes with additional features such as saving a favourite motorcycle parking for easy access. Penang Smart Parking is a free-to-use mobile application that comes with the necessary features starting from searching a car parking lot, navigating, and finally parking and making payment using the e-wallet feature of the mobile application. The subscription refers to the optional monthly pass feature. With the e-wallet feature, necessary functions such as reloading e-wallet, checking transaction history, registering vehicle, and viewing notifications are available. Unfortunately, at the time of writing, the transfer credits feature could not be tested as it is unavailable.

The necessary features to be implemented to the shopping mall motorcycle parking lot mobile application after comparing UK Motorcycle Parking, London Bike Bays, and Penang Smart Parking mobile application are search and view parking information, integrated map, create account, register motorcycle, and e-wallet. Searching and viewing parking information is the main function of the mobile application and will be supported with the e-wallet feature for the payment of the shopping mall motorcycle parking lot parking fee for motorcyclists to enter and park their vehicle in the shopping mall motorcycle parking lot. Users need to create an account to access the e-wallet feature which allow users to perform reload, view transaction history, and make payment for registered motorcycles. Users need to register their motorcycle by providing the motorcycle number plate characters before making payment through the shopping mall motorcycle parking lot mobile application for the shopping mall motorcycle parking lot parking fee. However, as this project is not meant to be implemented for real-world use yet, bank transactions or any transactions involving money will not be included. In Penang, there is no similar mobile application like UK Motorcycle Parking or London Bike Bays for motorcyclists and Penang Smart Parking mainly works for car drivers. Currently, most motorcyclists in Penang can only find for motorcycle parking once they reach the location. The shopping mall motorcycle parking lot mobile application could initiate more mobile applications relating to motorcyclist to be developed in the future.

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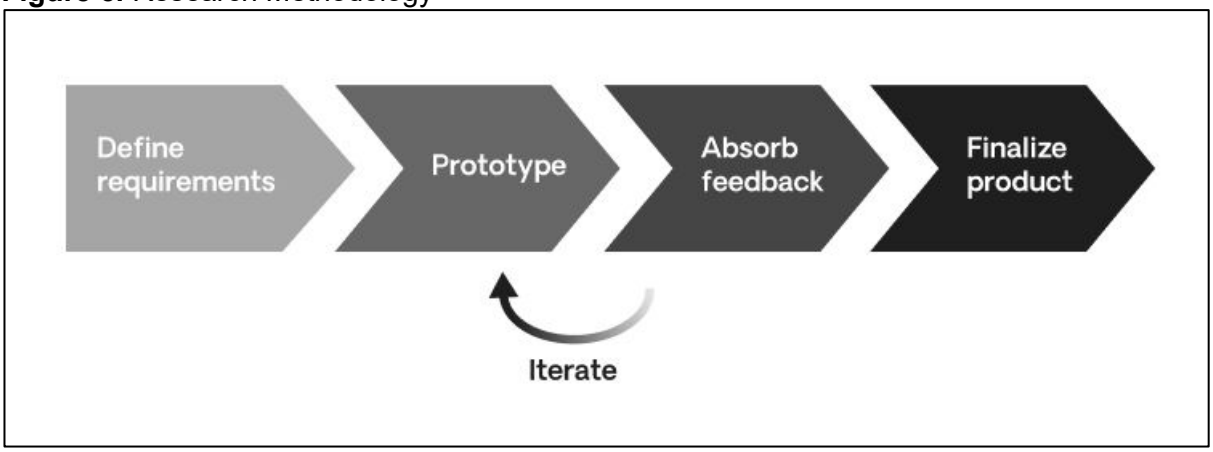
RESEARCH METHOD

The project methodology used for this project is the Rapid Application Development (RAD) methodology. RAD uses an incremental and prototyping approach to generate phased deliverables (Mramba & Kaijage, 2018). The prototyping approach allows the developer to implement useful feedback before finalizing the product.

Figure 5. Research Methodology



Define Requirements

In this phase, research was made on the current shopping mall motorcycle parking lot payment method, review and comparing mobile applications relating to parking or motorcycle parking, development tools of both software and hardware to be used. The payment method has evolved from cash to cashless payment method throughout the years. However, the cashless payment method of using a card stills provide some form of inconvenience to motorcyclists. Hence, with the rise of popularity of mobile applications, this project aims to develop a mobile application that target both Android and iOS users for motorcyclists to pay to enter and park at the shopping mall motorcycle parking lot.

Prototype

In this phase, mid fidelity prototype was created to realise the user interface of the shopping mall motorcycle parking lot mobile application, and high-fidelity prototype to test the functionality of the shopping mall motorcycle parking lot mobile application along with the user interface designed.

Absorb Feedback

In this phase, the high-fidelity prototype was used to obtain feedback through review by the users by testing the high-fidelity prototype. All feedback obtained was reviewed in a professional manner to improve the outcome of the project. The feedback obtained was verified to ensure that it matches the defined requirements for the project. When changes are necessary, iteration was made, and the current phase will be returned to the previous prototype phase to develop a new prototype with the necessary iteration. Iteration was made until the defined requirements are met.

Finalize Product

In this phase, the defined requirements were met and ready for final testing. There should be no additional new development of functionalities made unless there are any special circumstances.

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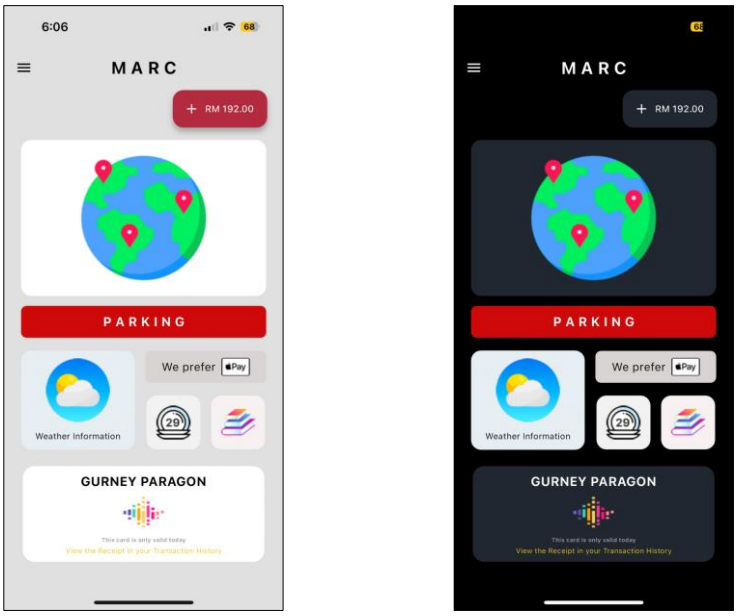
RESULTS

The name of the shopping mall motorcycle parking lot mobile application is M A R C which allows motorcyclists to pay the parking fee to park in the respective shopping mall motorcycle parking lot before arriving at the shopping mall motorcycle parking lot which provides an arguably much convenient process compared to the current method of paying the parking fee to park in the shopping mall motorcycle parking lot for the motorcyclists.

Figure 6. Home screen



Users can make payment for the parking fee by first selecting the shopping mall motorcycle parking lot that they wished to park their motorcycle in. After selecting the shopping mall motorcycle parking lot, users will be greeted with a general information screen which requires users to read and understand before proceeding with the payment. The general information screen is shown in Figure 7 and the payment process ends in Figure 9.

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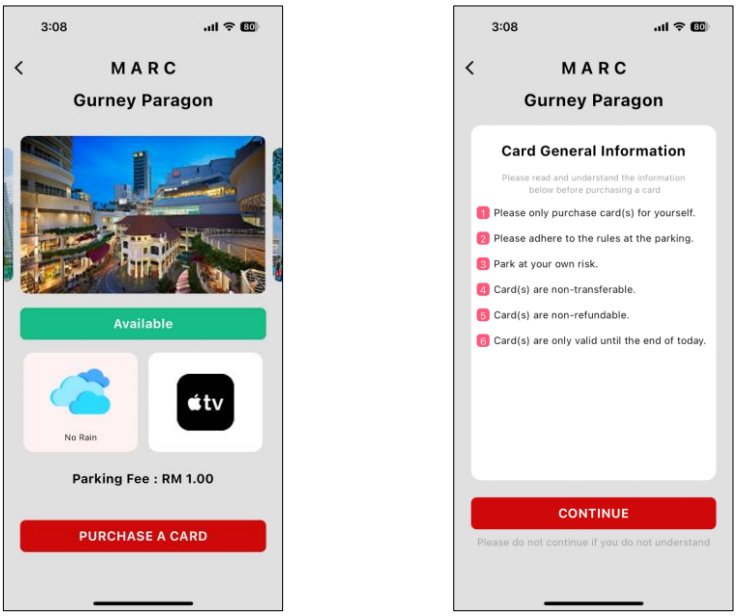
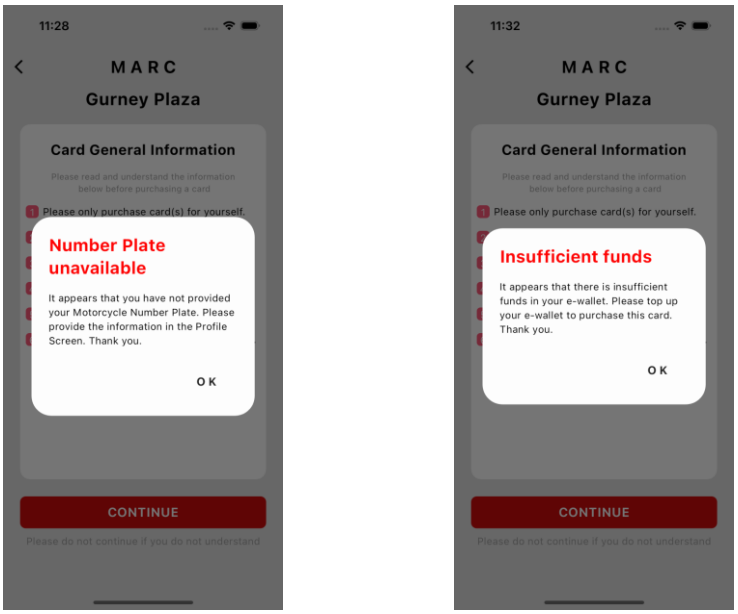
Figure 7. Shopping Motorcycle Parking Lot Information



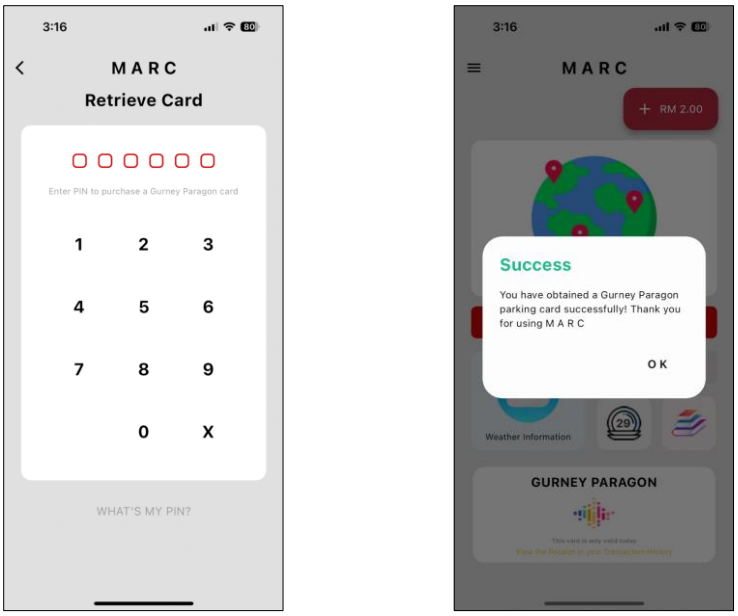
User needs to ensure that they have registered their motorcycle number plate in the shopping mall motorcycle parking lot mobile application, ensure that they have sufficient balance in their e-wallet, and ensure that they have set a PIN for their e-wallet before successfully making payment for the parking fee of the selected shopping mall motorcycle parking lot. The payment alert dialog is shown in Figure 8.

Figure 8. Alert Dialog



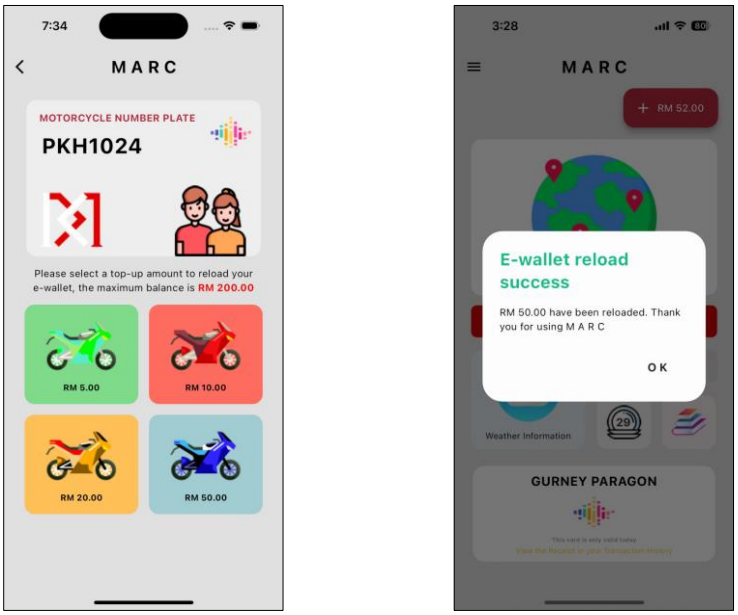
Upon entering the correct PIN, the payment process is completed. The user's e-wallet credit will be deducted accordingly, a receipt will be generated, and the shopping mall motorcycle parking lot card will be displayed in the home screen.

Figure 9. Payment Screen



Users need to use the e-wallet to make payment for the shopping mall motorcycle parking lot through the mobile application. The wallet screen is shown in figure 10. In the wallet screen, users can choose to reload their e-wallet by RM 5.00, RM 10.00, RM 20.00, or RM 50.00 only. However, there is a maximum limit of RM 200.00 for balance in the e-wallet.

Figure 10. E-Wallet Screen



DISCUSSION

The main achievement of the project was developing a cross-platform mobile application successfully. The objectives for this project were achieved as the shopping mall motorcycle parking lot mobile application allows motorcyclists to enter the shopping mall motorcycle parking lot after making payment for the parking fee through the mobile application and motorcyclists can identify whether the shopping mall motorcycle parking lot is available, full, or under maintenance through the mobile application.

CONCLUSION

The shopping mall motorcycle parking lot mobile application was developed to provide motorcyclists an alternate payment method to pay for the shopping mall motorcycle parking lot parking fee through the mobile application and to help motorcyclists to understand the status of the shopping mall motorcycle parking lot through the mobile application before arriving at the shopping mall motorcycle parking lot. The main feature of the shopping mall motorcycle parking lot mobile application is the payment for the parking fee using the mobile application and displaying the status of the shopping mall motorcycle parking lot in the mobile application. Lastly, unit and usability testing were conducted to ensure that the shopping mall motorcycle parking lot mobile application functional. The test results show that the objectives for this project have been achieved after testing the shopping mall motorcycle parking lot mobile application: M A R C.

LIMITATION

Currently, users of the shopping mall motorcycle parking lot mobile application can only make payment for the parking card once a day for each shopping mall motorcycle parking lot based on the conditions set. If the user needs to purchase two parking cards from one shopping mall motorcycle parking lot in one day, it is not possible to prevent duplication of parking card. In addition, users cannot pre-purchase shopping mall motorcycle parking lot card and users can only purchase shopping mall motorcycle parking lot card for today only, the purchasing multiple shopping mall motorcycle parking lot card is convenient for users who is sure to visit the shopping mall on a frequent basis such as the employees working at the shopping mall and parks their motorcycle in the shopping mall motorcycle parking lot on a frequent basis weekly or daily. To cater to more users, multiple language support is necessary. The shopping mall motorcycle parking lot mobile application can begin to support languages commonly used in Penang such as the Malay language.

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DECLARATION OF CONFLICTING INTERESTS

The authors declared no potential conflicts of interest.

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