International Journal of Undergraduate Research 3 (1): 83-92, 2022
e-ISSN: 2682-8189

DOI: 10.26666/rmp.ijur.2022.1.13

HITCHHIKER: A Software Model For Ride Sharing Among In-Campus Students

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Abstract: There are many aspects of ride-sharing that can be studied. Studies in the US, Europe and Asia presented findings which support the positive outcome of the transportation solution among in-campus students. Some benefits of ride-sharing include improved social life when students can save money and time to move around, a less congested campus environment and solved parking issues. However, most Universities restrict students from bringing their own vehicle, and public transport can be limited. This study proposed a ride-sharing solution - HITCHHIKER in Universiti Utara Malaysia. It is a system that allows the car owners to fill in their available empty for those students who need the transportation service. Unique to the environment studied, even though there are several methods that students can travel, which are 'teksi sapu' service or car rental service, some issues were triggered as the university authority does not recognize these services. Using the UUM campus as a case study, we aim to describe the research and applications development work demonstrated and its contribution to the ride-sharing model among in-campus students. The functional requirements are gathered by referring to similar applications like Grab. Future work should add more safety features to enhance this app further and collaborate with university authorities to implement this application among university students.

Keywords: *Hitchhiking, Ride-Sharing in Campus, University Students, Mobile Application, Software Model.*

Received: 15 May 2022; Revised: 30 May 2022; Accepted: 10 June 2022; Published: 30 June 2022.

1. Introduction

Hitchhiking, or can be known as thumbing, a means of asking for a ride, and usually, the driver is a stranger. Usually, the driver provides a free ride to the hitchhiker, but not always. They used different signals to ask for a ride in a different country. For example, in North America or Europe, most thumbs up with pointing upwards to show that they need a ride, while in some African countries, they will hold their hand with the palm facing upwards [1]. Usually, the hitchhiker and driver do not know each other, so this could trigger some safety issues as we do not know counterpart identity, whether they are a friendly traveller or a vicious murderer, an escaping criminal, or a sex maniac. Hitchhiker or driver's safety will not be guaranteed because the available data to study the safety of hitchhiking is very limited as it requires counting rides, counting problems, and counting hitchhikers, which is a difficult task.

Luckily, thanks to the advancement of technology, now the passenger can share a ride based on the ride-sharing mobile application. So passenger and driver's safety can be guaranteed by using the ride sharing mobile application;

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passenger and driver's safety can be guaranteed as well as they need to provide more detailed information about them, usually by third-party applications such as Twitter, Google or Facebook. So although it is a bit different between a ride-sharing application and hitching a ride by thumbing on the side of the road, it also achieves the same benefits that passengers can request for a ride as the driver has empty seats.

Ride-sharing is defined as taking one or more passengers in the car when taking a trip instead of driving alone. Basically, this idea is to stop the passenger on a stop along the trip. One of the most popular ride-sharing services worldwide is Uber, which started in 2010. As ride-sharing services provide convenience to passengers for multiple reasons, Uber's reputation has risen rapidly worldwide. For example, in Sydney, Uber is offering a service for areas marked as deserts as those areas have no access to a taxi or rail system [2]. Besides that, Uber offers service day and night where public transportation is usually stopped from operating after certain hours.

Moreover, the ride-sharing payment system is also convenient for passengers and drivers. They can pay or receive money through the mobile application where their payment information can be saved. Furthermore, the rating system in the ride-sharing services also makes it convenient for the passenger to rate the driver. As the driver wants to achieve a higher rating, this will push the driver to work harder to improve their service like safer driving, a cleaner car or other methods to make the passenger more comfortable along the journey. In Malaysia, Grab has become a strong player in providing ride-sharing services via mobile apps [2]. It employs the same business model as Uber and has further expanded to provide other services such as Grab Food, Grab Mart, Grab Shopping, Grab Pay (e-Wallet), etc.

Hitching a ride is deemed less risky compared to the commercial ride-sharing via mobile apps described previously [2]. However, both achieve the same objective: get the traveller or passenger from point A to point B under mutually agreed terms. The unique aspect of hitchhiking is that the passenger must trust the driver and be willing to take risks when travelling with strangers. In this regard, most hitchhikers use their common sense, trust their instinct and be prepared to take action when he or she senses some danger [3]. The range of technological mediation is significant nowadays and has grown to include mobile-enabled platforms to provide information [2]. E-services include facilitating traveller research, booking and management, social media and user-generated content [3]. These services use technology for customization and personalization and engage users in daily activity [2,3].

In order to explore the hitchhiking phenomenon using a mobile environment (technological mediation) and to test the applicability of the application within a small group of people, we have decided to choose one University campus in Malaysia as a case study. The phenomenon is unique as the campus has limited public transport connecting the campus with the nearest town, and secondly, most students are not allowed to bring their vehicles due to limited parking spaces. Unique to the campus scenario, the students rely on private car rental service or 'teksi sapu' service, where 'teksi sapu' service is like a taxi-based service and usually has a fixed fare to a particular place, but the safety issue of students cannot be guaranteed as the drivers are not registered with the authority. The students do not know the driver's background, nor does the driver. Therefore, when a student is in danger, no authority can save or help the student.

Due to this problem, there is an urgent need to create a safe environment for students to hitchhiking. This project started with a simple idea: a student (rider) hitchhiking another student (driver) while both feel safe as they know and trust each other. The application has been developed to allow the students to book a ride-sharing to travel to their destination using the mobile apps as a technology mediator.

This paper investigates the efficiency and potential of introducing the ride-sharing mobile application on a University campus. This study aims to design and develop a ride-sharing mobile application to provide a legal platform for students to travel outside and to reduce the drivers' burden. As a result, HITCHHIKER, a ride-sharing mobile application prototype, was developed and evaluated. This study is separated into different sections; where the first is to understand the system requirements for such an app, followed by the background and related studies on ride-sharing among in-campus students. The next section explains HITCHHIKER's design and development, and the subsequent section explains the usability evaluation testing of HITCHHIKER. The last section of this paper is to conclude all the studies in this paper and lists the future works.

Due to some limitations on time and resources, this study was conducted coincidentally with Malaysia's Movement Control Order period (MCO) between early to mid-2020, so we will focus on only one Malaysian University campus and conducted among on-campus students only.

2. Background and Related Studies

This section describes the background and related studies on ride-sharing among in-campus students. Later, this section will also discuss how information technology can be implemented to solve the transportation problem on the University campuses and a few ride-sharing applications currently available in Malaysia.

We have decided to choose one University campus in Malaysia – Universiti Utara Malaysia (UUM) as a case study. This is because the dependency of the students on private car rental services or 'teksi sapu' service is quite heavy on the campus. 'Teksi sapu' service is like a taxi-based service and usually has a fixed fare to a certain place, but the safety issue of students cannot be guaranteed as the drivers are not registered with the authority.

In UUM, there are three methods for how the students travel outside the campus. The first method is by their car.

Some students have the privilege to bring their car to campus, and usually, they are final year students, Students' Representative Council members and top management team of any club in UUM [4]. When they have their own car inside the campus, they can freely travel around the campus or outside the UUM, but they need to pay all the costs by themselves, including fuel costs, toll fares and maintenance fees. After a long time, this may cause the students who have their own car burden as they do not economically independent yet. So, this situation initiated some car owners providing transportation services around the campus, which basically are 'teksi sapu' or private car rental services.

'Teksi sapu' service is a kind of taxi-based service, but the difference between a taxi and 'teksi sapu' is usually taxi fares are counted by the travelling length, and 'teksi sapu' have a fixed cost to a place. For example, the 'teksi sapu' service fare from UUM to Changlun town is RM12, while Alor Setar town or Sultan Abdul Halim Airport is RM40. The car owner's private car rental service will usually be calculated by hour-based, where the first hour usually is RM10, and RM6 for subsequent hours.

Figure 1: Transportation Services Posts on NEWSEED's Facebook Page

Those students who do not have their own transport will seek transportation services from the car owners. Most car owners will post their transportation services in a Facebook group, which is NEWSEED – predominantly consisting of UUM's students and staff. When the students want to rent a car or request for 'teksi sapu' service, they will search in the NEWSEED (Figure 1). This action may consume their time, as NEWSEED is not only full of requests from students to ask for transportation services but also others such as lost and found posts, selling goods posts, promoting event posts etc. Besides, when some of the owners are already booked by other students, they will not notify the group, so other students would assume they still have empty seats or their car is free, which is not efficient for the students. Moreover, the safety of the students cannot be guaranteed as they have a transaction in private, so there is not any third party to monitor their transaction.

One of the necessities in an individual's life is mobility [1-3]. Therefore, the study of ride-sharing has become much more attention. The advantages that ride-sharing can provide to both drivers and passengers, or the environment and society, as it can save the travelling cost, reduce traffic congestion, reduce air pollution and conversion of fuel. The rise of mobile application technology initiated mobile application-based transportation, and the demand for ride services has increased, like Grab or Uber in Malaysia. Different ride-sharing service operators have different characteristics of their ride-sharing systems [5]. For example, some service operators have a fixed pick-up and drop-off location like an airport, transport hub or hotel.

On the other hand, some operators allow drivers to have their trip plans and preferences. Thus, the participants - passenger and driver should agree on the costs and schedule. Consumers well accept ride-sharing services in Malaysia. In July 2017, ride-sharing services were legalized in Malaysia [5]. Currently, ride-sharing services in Malaysia are available in Grab, MULA Car, EzCab, MyCar and Dacsee (see Table 1). The largest ride-sharing service provider is Grab. As of March 2018, it took over Uber. Getting the transportation service through a mobile application can reduce certain issues with taxi services. An example of the issues is inefficient, rude drivers; some taxi drivers will choose preferred destinations to travel to and overcharge.

A recent study shows that customers have a positive review of ride-sharing services as the customer can gain more quality services than conventional taxi services. For example, customers can search a trip based on ride-sharing services, where the trip usually has a fixed and legitimate price. Other than that, passengers can have a real-time tracking system to show the driver's current location and the estimated time of arrival.

Table 1: List of Ride-Sharing Apps in Malaysia

Related Studies	**Description**
Grab	Formerly known as GrabTaxi. The biggest and the most popular choice of ride sharing service provider in Malaysia. It allows passenger to pay the fares through the application or by cash. Grab has flat rate fares based on the waiting times, cars, or different cities.
MyCar	The largest ride-sharing service after Grab. MyCar provides various types of vehicles such as MPV cars, luxury cars or 5-seaters cars. MyCar usually provides a lower price compared to Grab on most routes. MyCar is available in most of the major cities.
MULA	Launched in 2016. MULA provides a large MPV car that can fit up to 10 people. Besides, MULA offers a service, MULA Pink, that will only fetch female passengers where cause the journey safety.

Dacsee	Dacsee allows drivers and passengers to build their own social circle, as they will let them earn loyalty rewards through referrals. The special feature on Dacsee allows a passenger to add a driver to a friend list and later can rebook the driver again in future.
EzCab	EzCab provides two kinds of fare: metered taxi-based or their own fixed fare. Drivers have the option to choose fixed fares as well. As an additional bonus, EzCab supports most of the electronic payments services in Malaysia, such as Maybank's QRPay or Touch n' Go eWallet.

Although there are many ride-sharing applications throughout Malaysia, those ride-sharing services focus more on the urban area, while UUM campus is located far away from the urban area. Exemplary studies in some Malaysian Universities have demonstrated a positive impact on this research domain.

For example, in UiTM Shah Alam, carpooling or ride-sharing is a practical approach to solving limited parking areas. Furthermore, ride-sharing helps to eliminate air pollution toward cleaner and greener campuses [2]. Universiti Malaya staff and students use "UM ShareRide" to move together to the same destination or events. Individuals willing to share their private vehicles with others may use the app to post their empty seats on their rides. It has resulted in a safe, less congested and greener environment too. The application is an efficient transport solution and creates better social life [6].

The cost of transportation is another aspect that needs attention. On-demand sharing solutions are getting popular, in which "one resource is utilized simultaneously by a circumstantial group of users" [7]. According to a European study, one of the main challenges of sharing resources under the logistic cost is splitting the cost within the group of travellers. However, most ride-sharing solutions solve the next challenge: how to form groups in a mobility system that offers shared rides. These challenges can be solved if all parties have a mutual agreement and perhaps know each other through the same institution, friends, etc. [8].

Future studies should investigate the users' trip purpose, for example, university [9]. Location of the destination, pick-up point, and other system factors (near distance, cost effective, etc.) produce a similarity [6-8]. On the other hand, different countries and continents may produce different results [9]. Hence it is worth investigating this path further.

Our study aims to minimize the transportation problem by providing a legal and safety service around the University campus. Secondly, we aim to develop and design a mobile application to allow University students to create, manage and reserve trips by using the mobile application to ease their travelling. Ultimately, using the UUM campus as a case study, we aim to describe the research and applications development work demonstrated and its contribution to the ride-sharing model among in-campus students.

3. Methodology of the Study

The study was conducted following the System Prototyping methodology (Figure 2). The System Prototyping model is a methodology that is treated as a software development model where a prototype is constructed and then tested, which is an approximate premature sample of the end product [10-12]. Then the analysis and design phase will be carried out again once there is any new requirement. Therefore, it can be considered a method of trial-and-error involving both the developers and the users [13].

In the planning phase, a common problem among in-campus students was identified. It was found that students suffer from transportation problems and cannot travel outside the campus. After much literature search, a project proposal is drafted after a plan is proposed to develop a ride-sharing prototype of the Hitchhiker application. First, a project proposal is drafted to explain the problems, the objectives, the significance of the projects, the methodology that will be applied in this project, and the schedule. Next, the analysis phase will define the requirements of the Hitchhiker application. Finally, there will be a series process of requirements analysis. The two types of requirements, functional and non-functional requirements, will be gathered and analyzed by referring to a similar application and distributing questionnaires to the University students and so on. Throughout this process, a set of lists of requirements will be produced. To make the requirements gathering and analysis more meaningful and in context, we chose UUM as a case study. In addition, other unique aspects of the environment were explored, such as the dependency on illegal ride-sharing services and safety issues.

In the design phase, a prototype is being developed. Several tools had been used to develop the prototype. In this study, Visual Studio Code is being used as the text editor. In order to keep the users' information, JomHosting will be used as the database for this application. This application will be hosted in cloud server. In this stage, a low-fidelity prototype is produced to refine the functional and non-functional requirements. The selected user evaluates the prototype as testing and suggestion for improvement. In the final implementation stage, a full application will be developed and most suitable to fully implement in UUM on a cloud service provider. A simple user training will be conducted among customers, car owners and administrators. This application will be observed and monitored on a regular basis in order to make sure this application will run smoothly without any interruptions.

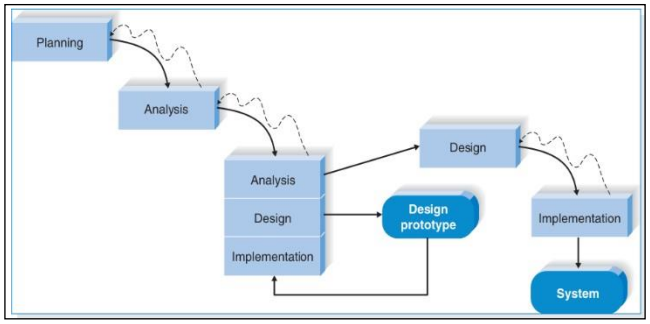

Figure 2: The phase of the System Prototyping methodology

4. Design and Development of HITCHHIKER

This section describes the design and development of a mobile application for creating and booking trips following the first three phases of System Prototyping. This section will be separated into two sections; (1) the requirements of the mobile application for creating and booking trips and (2) the prototype development of HITCHHIKER, a mobile application developed to demonstrate the gathered requirements.

In the requirement gathering process, one method was carried out - analyzing the similar and related to the ride-sharing application from the Internet. The related applications were searched in the Google Play Store and Apple App Store. Examples of similar applications analyzed are Grab, MyCar, MULA, Dacsee and EzCab. Table 2 below lists four requirements and the priority of the requirements. The requirements include registering an account, logging in to the system, and managing and reserving a trip.

Table 2: List of Requirements for Creating and Managing Trip

ID	Requirement Description	Priority
1	REGISTER AN ACCOUNT	
1.1	A passenger user shall be able to register to the app by entering their email, password, confirm password, name, matric number, phone number, residential hall and emergency contact number.	High
1.2	A driver user shall be able to register to the app by entering their email, password, confirm password, name, matric number, phone number, a residential hall, car brand, car model and car plate.	High
1.3	If compulsory fields are not completed, an error message, “Complete the mandatory fields” will be displayed on a pop-up window.	Medium
2	LOGIN TO THE SYSTEM	
2.1	Passenger or driver must login into the Hitchhiker application by keying in the username and password.	High
2.2	The system must verify the email and password of the passenger or driver.	High
2.3	If the user forgets the password, a user must key in their email to recover their password.	Medium
3	MANAGE TRIP	
3.1	The app shall be able to allow the user to touch the menu “ADD TRIP” on the menu bar rendered on the smartphone screen.	Medium
3.2	The app should allow the driver to add a trip by entering the origin, destination, pick-up point, departure date, estimated arrival time, travelling preferences and rewards.	High
3.3	The app should be able to store the trip information entered by the driver in the database.	High
3.4	The app shall be able to allow the driver to review the trip information.	Medium
4	RESERVE TRIP	
4.1	The app shall display a trip list in a page to allow passengers to select the trip.	High
4.2	The app shall allow passengers to reserve a trip by clicking on the “Accept Trip” button.	High
4.3	The app shall be able to allow the passenger to view a reserved trip.	Medium

The requirements shown in Table 2 were translated into the computer system functionality. The next step was visualizing the requirements as stated in the table above by using an appropriate modelling method and tools. In this step, a modelling language, Unified Modelling Language (UML), was used to visualize the requirements. The models used in this work use a case diagram, sequence diagram, and class diagram representing the application's structural components. The diagrams were drawn using STAR UML. Figure 3 illustrates the use case diagram and the communications between the use cases and the actor for a mobile app that can be used to create and manage trips. The four major use cases are registering an account, logging in to the system, creating trips, and reserving trips. In addition, the use case of “Manage Trip” allows users to perform some sub-functions such as “Add Trip”, “Delete Trip” and “Update Trip”.

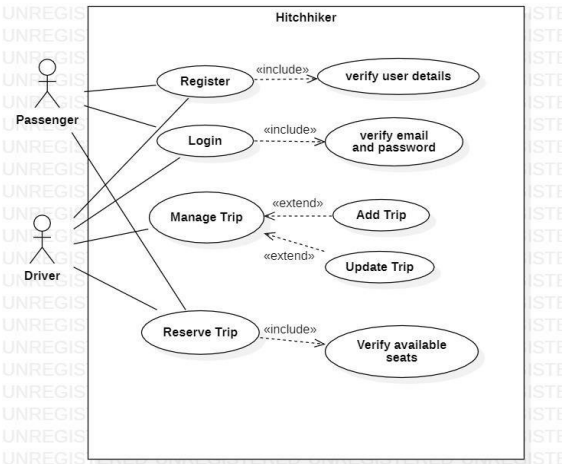

Figure 3: The Use Case Diagram of a Mobile App for Creating and Reserving Trips.

The use case diagram was detailed to show the mobile app's behaviour. Next, the object interaction that is arranged in a time sequence is shown in the sequence diagram (Figure 4). Finally, the structural components of a mobile app for creating and managing trips are represented in a class diagram shown in Figure 5. The class diagram in Figure 5 shows the attributes and operations of the app. There are about six classes in this work, which were identified: Hitchhiker Controller, Hitchhiker Panel, Trip, Passenger, Driver and Reservation. The interaction between the classes is shown in the diagram clearly.

The structural components of a mobile app for creating and managing trips are represented in a class diagram, as shown in Figure 5. The class diagram in Figure 5 shows the attributes and operations of the app. There are about six classes in this work, which were identified: Hitchhiker Controller, Hitchhiker Panel, Trip, Passenger, Driver and Reservation. The interaction between the classes is shown in the diagram clearly.

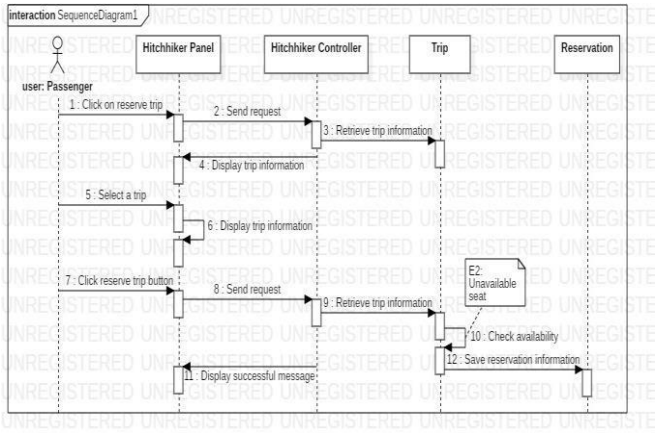

Figure 4: The Sequence Diagram of a Passenger Reserves a Trip

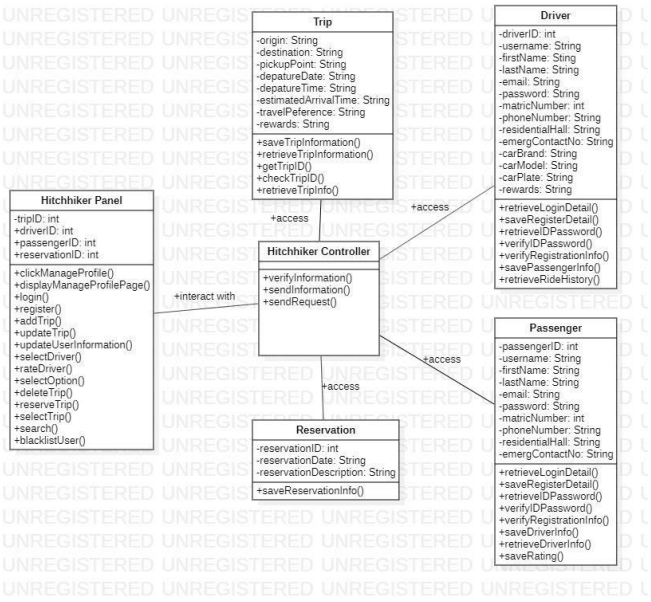

Figure 5: The Class Diagram of a Mobile App for Creating and Managing Trip

5. The HITCHIKER Prototype Development

A prototype of a smartphone device called HITCHHIKER was created to build and organize trips. It represents the requirements set out in the previous subsection. Software prototyping is a standard way to demonstrate the software requirements, therefore users can obtain additional comments and suggestions based on their experience of interacting with the prototype. The Visual Studio Code was acted as a text editor tool. Furthermore, the JomHosting platform was used to store the database and user authentication. Screenshots in Figures 6, 7, and 8 show the selected interfaces of HITCHHIKER. The system captures the student ID as a safety feature.

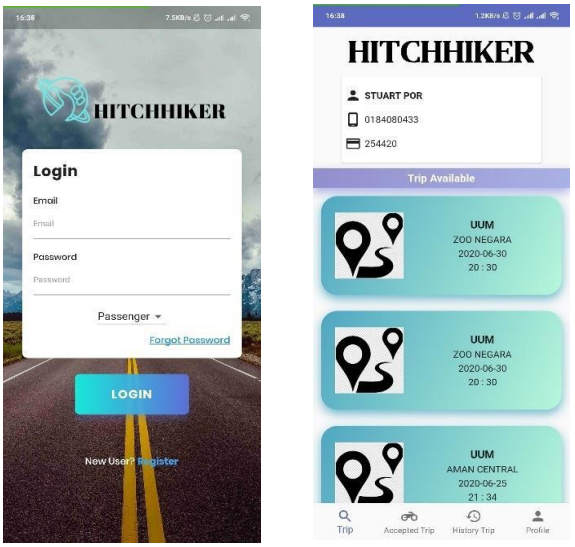

Figure 6: The interface for login (left) and main page of passenger (right)

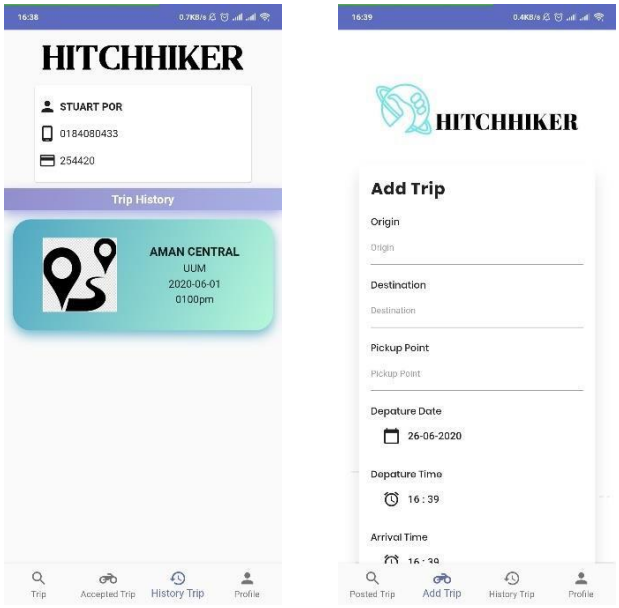

Figure 7: The interface for the accepted trip page of passenger (left) and manage profile page (right).

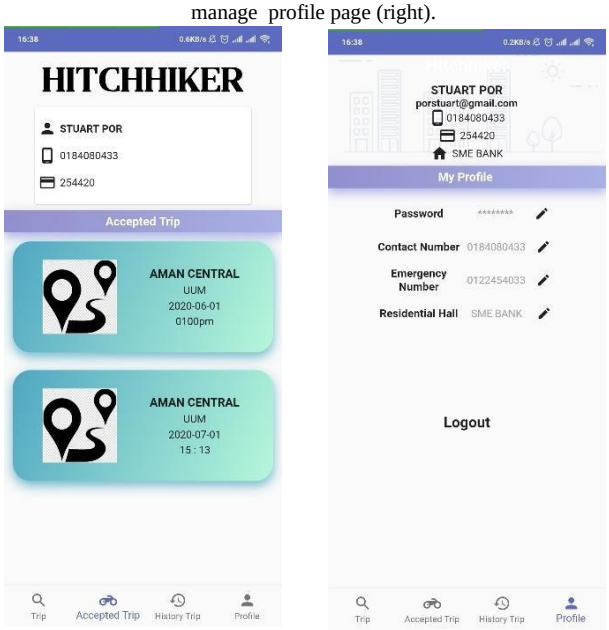

Figure 8: The interface for history trip of passenger (left) and add trip for driver (right)

6. Evaluation of HITCHHIKER

In this usability evaluation testing, about 30 respondents participated in this phase. This usability evaluation testing was conducted in May 2020; coincidentally, during Malaysia's Movement Control Order period, the fieldwork was rearranged to follow standard operation procedure (SOP) from the Ministry of Health Malaysia (MOH). Therefore, another method was chosen to be used, which was to distribute the questionnaire through Google Form and send the invitation through email. During the MCO period, the developer sent the invitation randomly to participants based on gender, race, and educational background.

The tool used for the evaluation was the HITCHHIKER app and a post-task questionnaire. The post-task questionnaire was adapted from [5], consisting of 28 items in two sections. The first section asked the demographic information about respondents, while the next section asked about the respondents' opinions about the HITCHHIKER app on a five-point LIKERT scale where one represents strongly disagree, and five represents strongly agree. The respondents needed to perform several activities step-by-step in the evaluation testing: (1) Download the HITCHHIKER app and interact with it as stated in the experiment procedure, and (2) answer the post-task questionnaire.

An analysis of respondents' demographic information illustrated that 70% were female while the rest, 30%, were male. Regarding the frequency of travelling outside, 60% of respondents said that most students travel outside the campus weekly, while 20% and 13% travel monthly and occasionally. Only 7% of respondents stated that they travel outside daily. Students travel outside because of outings, were about 63.33% of the respondents. 43.33% and 40% of respondents reported travelling because of having a meal outside the campus and returning to their hometown. Most respondents reported that their travelling method was by renting a car, which occupied 53.33%, while 33.33% of respondents called for the 'teksi sapu' service. Only 13.33% of respondents travelled by their own car.

Table 3: The Respondents' Responses on the Usefulness of HITCHHIKER

The post-task questionnaire items	Strongly disagree	Disagree	Neutral	Agree	Strongly agree	Average
Hitchhiker helps me to travel in ease way.	0(0.00)	0(0.00)	1(3.33)	6(20.00)	23(76.67)	4.73
Hitchhiker meets my needs.	0(0.00)	0(0.00)	5(16.67)	13(43.33)	12(40.00)	4.23
Hitchhiker does everything I would expect it to do.	0(0.00)	0(0.00)	7(23.33)	10(33.33)	13(43.33)	4.20
Hitchhiker saves my time when I use it.	0(0.00)	0(0.00)	1(3.33)	6(20.00)	23(76.67)	4.73
Hitchhiker is useful overall.	0(0.00)	0(0.00)	2(6.67)	7(23.33)	21(70.00)	4.63

Table 4: The Respondents' Responses on the Ease of Use of HITCHHIKER

The post-task questionnaire items	Strongly disagree	Disagree	Neutral	Agree	Strongly agree	Average
Hitchhiker is easy to use.	0(0.00)	0(0.00)	1(3.33)	9(30.00)	20(66.67)	4.63
Hitchhiker is user friendly.	0(0.00)	0(0.00)	2(6.67)	11(36.67)	17(56.67)	4.50
Hitchhiker is flexibility.	0(0.00)	0(0.00)	3(10.00)	12(4.00)	15(50.00)	4.40
I can use hitchhiker without written instruction.	0(0.00)	0(0.00)	4(13.33)	10(33.33)	16(53.33)	4.40
I can easily remember how to use it.	0(0.00)	0(0.00)	2(6.67)	8(26.67)	20(66.67)	4.60
I can use hitchhiker successfully every time.	0(0.00)	0(0.00)	3(10.00)	4(13.33)	23(76.67)	4.67

Table 5: The Respondents' Responses on the Satisfaction of HITCHHIKER

The post-task questionnaire items	Strongly disagree	Disagree	Neutral	Agree	Strongly agree	Average
I am satisfied with hitchhiker.	0(0.00)	0(0.00)	0(0.00)	10(33.33)	20(66.67)	4.67
I would recommend hitchhiker to my friend.	0(0.00)	0(0.00)	4(13.33)	15(50.00)	11(36.67)	4.23
I feel I need to have hitchhiker.	0(0.00)	1(3.33)	8(26.67)	12(40.00)	9(30.00)	3.97
I think students of UUM need to have hitchhiker.	0(0.00)	1(3.33)	6(20.00)	14(46.67)	9(30.00)	4.00
Hitchhiker is wonderful and pleasant to use.	0(0.00)	0(0.00)	0(0.00)	4(13.33)	26(86.67)	4.87

Table 6: The Respondents' Responses On the Functionalities of HITCHHIKER

The post-task questionnaire items	Strongly disagree	Disagree	Neutral	Agree	Strongly agree	Average
Hitchhiker can get my information correctly.	0(0.00)	0(0.00)	1(3.33)	6(20.00)	23(76.67)	4.73
Hitchhiker allows me to view and accept the trip.	0(0.00)	0(0.00)	1(3.33)	6(20.00)	23(76.67)	4.73
Hitchhiker allows me to update my profile.	0(0.00)	0(0.00)	2(6.67)	8(26.67)	20(67.67)	4.60
Hitchhiker allows me to enter the trip information such as destination, origin, departure date and time, rewards.	0(0.00)	0(0.00)	1(3.33)	6(20.00)	23(76.67)	4.73
Hitchhiker is able to show the accepted trip correctly.	0(0.00)	0(0.00)	1(3.33)	7(23.33)	22(73.33)	4.70

In Section B of the post-task questionnaire, an investigation was performed on the respondents' answers. The segment tested the attitude of the respondents on the effectiveness and ease of use of HITCHHIKER. It also assessed the satisfaction of the respondents with HITCHHIKER and its functionalities. Tables 3, 4, 5, and 6 reported the frequency and average of the responses. The respondents scored four or five on the post-task scales for the three aspects of usability. Only one respondent rated two in satisfaction on HITCHHIKER, and a few rated neutrals.

The evaluation results suggested that HITCHHIKER, upon testing against the usability evaluation principle, is useful and easy to use [14]. The respondents were also highly satisfied with the application's features that facilitate them in creating, managing and reserving trips. HITCHHIKER allows them to reserve trips, manage trips and view trips correctly. They also perceived that HITCHHIKER could help them create, manage and reserve trips effectively and save them a lot of time. While from the user interface aspect, as respondents reported, they mentioned that the HITCHHIKER could be used easily without any written instruction and the step of using the HITCHHIKER was easy to remember. Moreover, the respondents were satisfied with the HITCHHIKER and would recommend the mobile app to others.

The rise of ride-sharing applications in the case of the UUM campus could benefit drivers and passengers. Some students who are allowed to bring their own car usually could travel anywhere outside the UUM freely, which could burden them financially. They need to pay for the fuel costs by themselves, sometimes with toll fares. When introduced in UUM, this mobile application allows students to look for a ride to the same destination as the driver where a driver can get some rewards when they fetch the students to the destination, such as free drinks, split the fuel costs or toll fares equally [15]. The student ID registered with the University upon captured in the system provides safety features to increase trust to both driver and rider when using the service. As the campus is located far from the nearest town and public transport is limited [4], the apps are a cost-effective solution to the transportation problem [16]. It conforms to the findings of studies in China and Europe, in which students are more willing to ride-sharing when money-cost is at stake rather than the time-cost factor [7,8]. Furthermore, following the same pattern as other studies in Malaysian Universities, such as in UiTM and UM [2,6], it promotes safety and a less congested campus environment when going together to the same destination or event within and outside the campus with fellow students.

6. Conclusion and Future Work

This paper presented the work that demonstrated its contribution to the model of ride-sharing among in-campus students. A software model that describes the design and development of a mobile app for creating, managing and reserving trips has been presented. There are many aspects of ride-sharing that can be studied. The HITCHHIKER performed well in its functionalities and interfaces. Respondents also reported that they are willing to recommend this application to their friends. The safety features can be improved by extending the functionality by providing an emergency call button. Users can enter three numbers in their emergency contact list, and once the user is in danger and presses the emergency button, the system will immediately call the three numbers to search for emergency help. This button will increase the chances of passengers being rescued when they are in danger. In future, after the improvisation of the application, it can be further collaborated with university authorities to implement it among in-campus university students.

7. Acknowledgement

This research received no specific grant from any funding agency in the public, commercial, or not-for-profit sectors.

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