



RITVET

Homepage: <http://publisher.uthm.edu.my/periodicals/index.php/ritvet>
e-ISSN : 2785-8138

Development of An Android Application for Carpooling in UTHM

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DOI: <https://doi.org/10.30880/ritvet.2021.01.01.013>

Received 26 January 2021; Accepted 18 February 2021; Available online 31 March 2021

Abstract: Carpooling is a transportation concept where drivers can share their vehicle with the passenger who needs the ride. Excessive vehicles are one of the main causes of air pollution and traffic jams, while the situation can be solved through carpooling. The problem is that the platform existed for carpooling served with limited function. Thus, an Android-based application with the primary objective to carry out carpooling is proposed. The study aims to test the functionality of the Android Application developed. This carpooling app named ShareShare is being developed according to the prototyping model, and Firebase is used as its database. ShareShare serves as a platform that allows users to provide or to request carpooling services. Besides that, ShareShare also allows users to discuss their trip or ride using the chat function provided. ShareShare is equipped with an emergency contact function to ensure every user's safety when there are any emergency cases. After evaluating four persons of expertise, ShareShare is getting a positive review and feedback in the interface design, the interactive design, and the overall satisfaction after using the application ShareShare. On the other hand, ShareShare receives some useful advice from experts to better improve the developed application, which includes considering the font size of the application to make sure it fits every type of device.

Keywords: Carpooling, Android Application, Provide and Request Carpooling

1. Introduction

Since Malaysia's independence in 1957, the evolution that happened in Malaysia has made the country famous and popular as one of the world's advanced countries. The growth of the country has led to an improvement in many aspects and one of them is transportation. The transportation advancement in Malaysia has become one the essential cornerstone in the development of economy and infrastructure. Followed by the growth of the country, the amount of private vehicles also increased at a fast speed. The registered amount of vehicles in Malaysia has reached more than 2.8 million units

(Jonathan, 2017). The high-speed growing amount for vehicles has caused problems including traffic jam and increased road accident cases.

Traffic jam is a world issue that happens all day and all around the world, and the main consequences are a waste of time and source and environmental pollution (Shilpa & Ramandeep, 2016). Most people who live in the city experienced traffic jams, and the annoying part is not waiting but the unknown waiting period. One of the main reasons that caused traffic jam is the increasing population that was directly resulting in the increasing amount of vehicles. The excessive amount of vehicles that the road was unable to afford is the main reason why the increasing amount of vehicles is resulting in traffic jams.

Traffic safety is always a challenge for the transportation system either for the past, now, or the future (Chunjiao Dong et al., 2018). In 2016, there were 960,569 cases of road accidents in Malaysia which caused 7,152 victims dead (Ministry of Transport Malaysia, 2016). One of the main reasons causing these is the excessive amount of vehicles on the road.

On the other hand, the carbon monoxide emitted from the vehicle also becomes the main cause of air pollution (Dietz et al 2009). In Malaysia, starting from January of 2012, the air quality is facing descent and failed to achieve the national standard (Ahmad Fadzil et al, 2013). Solutions towards the excessive amount of vehicles that caused so many problems should be implemented to avoid the worst situation.

Carpooling is one of the effective solutions that can reduce the amount of vehicles on the road. Carpooling is a concept to share the vehicles (Bruglieri et al, 2011). There is a lot of people who drive alone with the empty seats left unused. Thus, carpooling is proposing to share the unused empty seats of the vehicle to reduce the amount of vehicles on the road (Arpita Dixit et al, 2012).

However, carpooling is quite an awkward activity to do as it includes the action to ask for carpooling from friends or neighbors. Carpooling has become difficult as there is no such platform for people who wish to share. Therefore, a platform should be developed that allows people who wish to share can post the information about the ride he or she can provide, as well as for the passenger who needs the ride to request to share without any awkwardness.

As a result, development of an Android application named ShareShare that works as a platform of carpooling is proposed in this research. The objective of this research is to design and develop an Android application as a platform for students and staff from UTHM to provide and to request a ride. Besides this research also evaluates the functionality and usability of the developed application to make sure the application works fine without error.

2. Literature Review

Carpooling is an activity that involves two or more persons in a car sharing trip toward a certain destination. There will be two kinds of character which the passenger as carpooler and the driver as ride provider. According to Burris and Winn (2006), carpooling happens when the driver decides to pick up the passengers who can share the cost of the trip. Since there are more people using one vehicle, thus carpooling does help in reducing the amount of vehicles on the road. Moreover, carpooling also helps in reducing air pollution problems as the greenhouse gasses emission is decreased by the reduced number of cars. At the same time, carpooling is reducing the traffic congestion. Traditional carpooling is people asking verbally for a hitchhike or making a phone call asking whether there is anyone heading to the same direction or destination on the acceptable time and is it possible to share the ride. These processes without a platform are too manual and unsystematic that could result in an awkward and embarrassing situation.

Technology and approaches being used in the proposed project included Android application, Instant Message (IM) System, as well as Global Positioning System (GPS). Android is a mobile software stack which includes operating system (OS), middleware and key application (Android, 2011). Android application is a software application that is designed to be run on Android based devices. Android apps can be written in Java, Kotlin and C++ by using the Android software development kit (SDK). Instant message (IM) is a type of communications service which allows people to communicate in real-time through the internet. Presence of instant messaging system allows users to subscribe to each other and be notified of changes in state and allows user to send short instant messages among each other (Day, et al., 2000). Instant messaging can be established on electronic devices as well as the devices connected to the server. On the other hand, Global Positioning System (GPS) is a satellite navigation system that provides geolocation and information of time to the GPS receiver on anywhere on the earth or near the earth where there is an unobstructed line of sight to at least four or more GPS satellites (Peter, 1994). Table 1 showed the comparison result between three existing systems. The systems are Droupr, SnapRides, and Carpoolworld. ShareShare is developed based on the specifications found from these systems.

Table 1: Comparison Between Existing Systems

Features	Droupr	SnapRides	CarpoolWorld
Registration and Login	✓	✓	✓
Identity Verification	✓	X	X
Offering Ride	✓	✓	✓
Requesting Ride	✓	✓	✓
Instant Messaging	✓	✓	X
Rating	✓	X	✓
Booking without fees	X	✓	✓

3. Methodology

3.1 Prototyping Model

The model selected in developing the proposed application is the prototyping model. Prototyping model is one of the Rapid Application Development (RAD) methodologies (Dennis et al, 2013). There are four phases in prototyping methods which are planning, analysis, design, and implementation and prototyping. This model is chosen because it involves user interaction in the development process. Prototyping model involved users during the development process to always give opinion and feedback which was incorporated in the prototype. This makes the user requirement clearer as well as helps in cost and time saving since the product is being evaluated by users in every iteration. Planning is the fundamental process to understand the reason for developing the system and determine how it is going to develop (Dennis et al., 2013). In the first phrase planning, the problem statements, objectives, and the scope of the system were identified. Analysis phrase is important in identifying the requirement of the system and a mini survey was carried out to collect the needed information. The next phrase is design which included the draft design of user interfaces and the flow chart of the system. Lastly in the implementation phrase implementation of the system according to the designed blueprint and the prototype testing is conducted with the users to achieve an acceptable prototype before final evaluation. Since the selected model is a prototyping model, the development processes are in iteration process which every prototype created at the end of each iteration is tested by users to ensure the prototype met the users' requirements. After all the developed final product is evaluated by four experts. Those experts have experience in Android Application development and the apps developed is evaluated in the aspect of interface design, smoothness of the flow, as well as the functionality and usability of the apps. Figure 1 showed the prototyping model with its phrases.

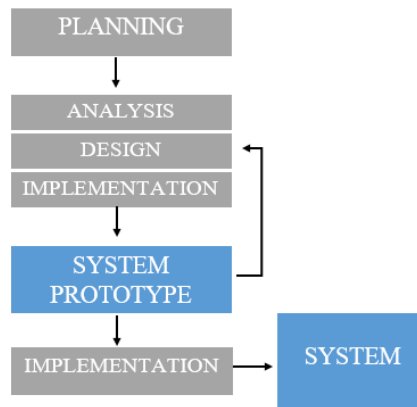


Figure 1: Prototyping Model (Dennis et al., 2013)

In the development process of this project, there were more than 4 prototypes designed and finally coming out with the final prototype accepted by the users. Even the icon of the application is designed several times from the very first version until the final version that is used as the final icon of the application. Figure 2 showed the first version of the interface and Figure 3 showed the latest interface. Figure 4 showed the first version icon and Figure 5 showed the final version icon currently used.

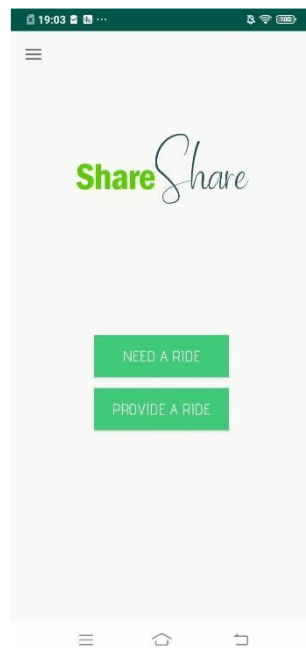


Figure 2: Old Add Post Interface

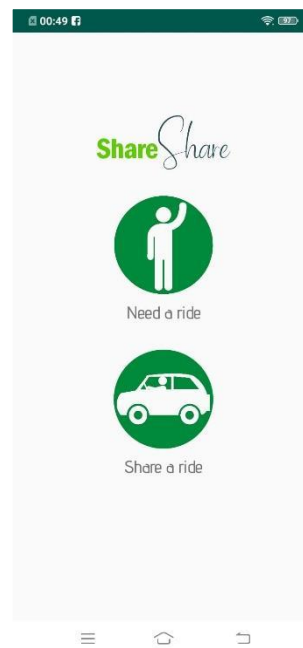


Figure 3: Latest Add Post Interface

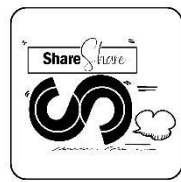


Figure 4: Old Version of Application Icon

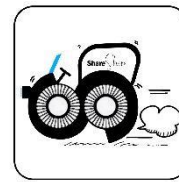


Figure 5: Latest Application Icon

3.2 Data Analysis

Data collected from the mini-survey were analyzed to have the user requirement information. In the mini-survey sessions, respondents were asked about their carpooling experiences and their perspectives about carpooling concept. Besides, their opinions and demand were also requested during the mini-survey sessions. Table 2 shows the result of the mini-survey.

Table 2: Software Used in the Development process

Questions	Response
Have you experienced being stuck in a traffic jam?	Yes – 10 No - 0
Have you agreed that the number of car in UTHM is the main reason why traffic jam occur?	Yes – 10 No - 0
Have you been carpooling?	Yes – 6 No - 4
How do you appoint the carpooling system?	Phone call – 10
Is the process of carpooling appointment state in the above item is easy and straightforward to use?	Yes – 0 No - 10
If a new app for carpooling system is developing, are you going to use it?	Yes – 10 No – 0
Is there any special request that needs to add to the carpooling app?	Chat function Order / request function Mapping function

3.3 Hardware and Software Requirement

The development process involved some hardware and software, which help in ensuring the smoothness of the development. Hardware used are a personal computer and android smartphones, while the software used is listed in Table 3. The main development software is Android Studio which the interface and system design is implemented. In Figure 6 has shown some coding segments when the Sign-Up button is clicked, and Figure 7 has shown the coding segment when the Edit Profile button is clicked.

Table 3: Software Used in the Development process

Software	Type
Programming Language	Java, XML, Python, HTML, JQuery, JavaScript
Android Development	Android Studio
Database	Firebase
Operation System	Windows 10
Mockup Design	Balsamiq
Documentation	Microsoft Word, Microsoft Project.

```
mRegisterBtn.setOnClickListener(new View.OnClickListener() {
    @Override
    public void onClick(View v) {

        if (TextUtils.isEmpty(mEmail.getText().toString())){
            mEmail.setError("Enter your Email");
            return;
        }

        if (TextUtils.isEmpty(mPassword.getText().toString())){
            mPassword.setError("Enter Password");
            return;
        }

        if (mPassword.getText().toString().length() < 6){
            mPassword.setError("Use 6 characters or more for your password");
            return;
        }

        progressBar.setVisibility(View.VISIBLE);

        //Register Starts Here
    }
});
```

Figure 6: Coding Segment When Sign-Up Button is Clicked

```
profileEditBtn.setOnClickListener(new View.OnClickListener() {
    @Override
    public void onClick(View v) {
        String options [] = {"Edit Name", "Edit Phone Number"};

        AlertDialog.Builder builder = new AlertDialog.Builder(getActivity());
        builder.setTitle("Edit Profile Informations");
        builder.setItems(options, new DialogInterface.OnClickListener() {
            @Override
            public void onClick(DialogInterface dialog, int which) {
                switch (which) {
                    case 0:
                        pd.setMessage("Updating Name");
                        showUpdateDialog(key: "name", name, phone);
                        break;
                    case 1:
                        pd.setMessage("Updating Phone Number");
                        showUpdateDialog(key: "phone", name, phone);
                        break;
                }
            }
        });
    }
});
```

Figure 7: Coding Segment When Edit Profile Button is Clicked

4. Results and Discussion

The developed application has been evaluated by four persons of an expert in information technology, and three of them have experience in Android application development. The evaluation is carried out through a questionnaire divided into three main aspects: design of user interfaces, the interactive design, and the overall satisfaction after using the application. As a result, the developed application ShareShare receives positive feedback from the experts, while at the same time some useful advice and opinions are given by the experts. Consideration of the font size is being advised by one of the experts to ensure the font size is appropriate and fit every type of Android device. Besides, there is also advice on interactive design which suggested developer design a more consistent interface, for example, the back button on every interface. Figure 8 showed the overall satisfaction of four experts after using the developed application.

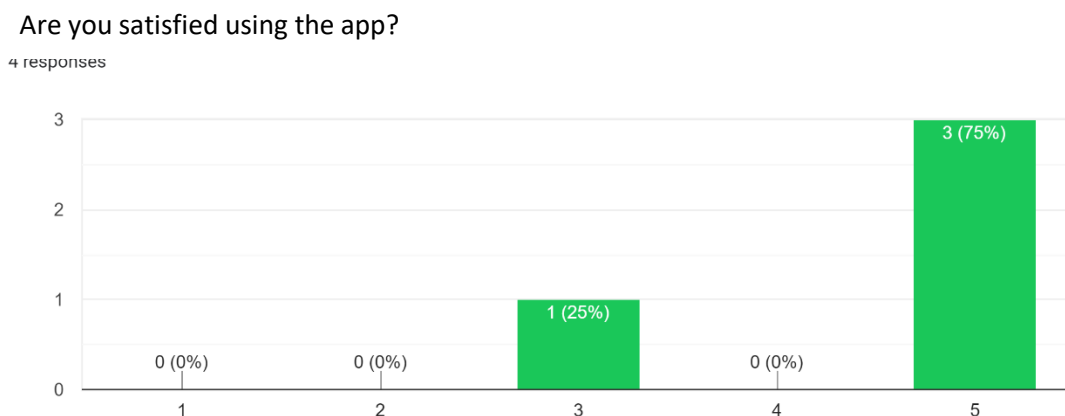


Figure 8: Overall Satisfaction of Experts After Using the Application

5. Conclusion

ShareShare was developed as a platform to carry out carpooling activities including providing or requesting a ride. ShareShare has made vehicle sharing or carpooling more straightforward and more systematic by just using the developed ‘need a ride’ and ‘share a ride’ functions. Besides, ShareShare also provided a chatting platform for users to discuss the trip they are sharing. While ShareShare does have weaknesses such as no notification can notify the users about the situation when users receive a message, when users’ request is being accepted or rejected, and when any users have posted a new ride. ShareShare also has a weakness in user verification. The users can register as many accounts as he wants, and the system cannot identify that those users are the same person. Lastly, as advised by the expert, the interface does not fit in every kind of device which in some cases, the font size will be inappropriate. In conclusion, ShareShare is achieving the research objectives that create a platform for carpooling in UTHM. From the overall functionality perspective, ShareShare has received positive feedback from the users. Thus, ShareShare is qualified to be used as a carpooling platform in UTHM. The advice given is considered in achieving a better improvement in the functionality and usability of ShareShare in future development.

References

- Ahmad Fadzil, Ahmad Shuhaili, Sany Izan Ihsan, dan Waleed Fekry Faris. (2013). Air Pollution Study of Vehicles Emission In High Volume Traffic: Selangor, Malaysia As A Case Study. *WSEAS Transactions on Systems*, 12(2):67-84.
- Android. (2011). *What is Android?* Dicapai daripada <https://www.android.com/what-is-android/>
- Arpita Dixit, Shweta Bora, Sonali Chemate, Nikita Kolpekwar. (2012). Real-Time Carpooling System for Android Platform. *International Journal of Engineering and Innovative Technology (IJEIT)*, Volume 2, Issue 6, December 2012.
- Burris, M. W., & Winn, J. R. (2006). Slugging in Houston—casual carpool passenger characteristics. *Journal of Public Transportation*, 9(5), 2.
- Bruglieri, M., Ciccarelli, D., Colorni, A., & Luè, A. (2011). PoliUniPool: a carpooling system for universities. *Procedia-Social and Behavioral Sciences*, 20, 558-567.
- Chunjiao Dong, hunfu Shao, Helai Huang, Xiaoming Chen, dan N. N Sze. (2018). Advances in Traffic Safety Methodologies and Technologies. *Journal of Advanced Transportation*, Volume 2018, Article ID 4129582, 2 pages.

- Day, M., Rosenberg, J., & Sugano, H. (2000). *A model for presence and instant messaging* (No. RFC 2778).
- Dennis, A., Wixom, B. H. and Roth, R. M. (2013). *System Analysis & Design*. 5th Edition. John Wiley & Sons, Inc
- Dietz, T., Gardner, G. T., Gilligan, J., Stern, P. C., & Vandenbergh, M. P. (2009). Household actions can provide a behavioral wedge to rapidly reduce US carbon emissions. *Proceedings of the National Academy of Sciences*, 106(44), 18452-18456.
- Jonathan Lee. (2017). *Vehicle registrations in Malaysia hit 28.2 million units*. Achieved from <https://paultan.org/2017/10/03/vehicle-registrations-in-malaysia-hit-28-2-million-units/>
- Peter H. Dana (1994). *Global Positioning System Overview*. Department of Geography, University of Texas at Austin. Retrieved on 28 September, dicapai daripada https://www.colorado.edu/geography/gcraft/notes/gps/gps_f.html
- Shilpa T., & Ramandeep S. (2016). A Review of Traffic Congestion Problem and Various Automated Traffic Measurement Sensors and Techniques. *Indian Journal of Science and Technology* 9(47).