



Using Kano Model to Prioritize Requirements for UiTM Share Ride Mobile Application Development

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Abstract: One of the major issues in a university campus is the trouble of discovering parking spots. With excessive number of cars entering Universiti Teknologi MARA (UiTM) main campus and limitation of parking spots, vehicle parking is one of the major problems faced by the university's staff and students. Carpooling or ride-sharing is viewed as the practical approach to solve this problem. The suggestion to share rides will lessen the amount of vehicles entering UiTM campus thus reducing parking space problem and decrease fuel emission for a cleaner and healthier environment. Development of UiTM Share Ride Mobile Application will be a medium for UiTM staff and students to share their rides thus, requirements engineering of the application need to be performed. In this research, data collection methods such as online surveys and interviews were used to provide accurate requirements for the development of the application. Using thematic analysis and Kano Model prioritization technique, specific quality characteristics and degrees of accomplishment were used to assess the requirements in view of consumer satisfaction. As a result, a total of seventy-seven requirements has been gathered and categorized according to the Kano technique and a use case diagram was built to demonstrate the requirements functionalities of UiTM Share Ride Mobile Application.

Keywords: Kano Model, Requirements Prioritization, Mobile Application, Ride-Sharing, UiTM.

I. BACKGROUND

With excessive number of cars in university campus and limitation of parking areas, parking space problems occur in most of university campuses all around the world (Kurkovsky, 2014). It is a typical issue not only in universities, but also in shopping complexes, stadiums, apartments and other open ranges in most urban areas (Abdullah et. al, 2012). Universiti Teknologi MARA (UiTM) being the largest higher learning institution in Malaysia in terms of size and population, has campuses in all 13 states of Malaysia with around 170,000 students on its enrolment with 25 faculties offering more than 300 courses (Sen et. al, 2011). In UiTM, where the parking spots are very limited for staff, students and visitors, discovering vehicle parking spaces is of the most highlighted issues (Essays, 2018).

Revised Manuscript Received on October 30, 2019.

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This situation becomes worst especially during holiday seasons, peak hours, sales carnival or any other festivals (Abdullah et. al, 2012). Car-sharing, carpooling or ride-sharing is a term generally used when people are sharing a vehicle together to go to a common destination. Jadhao and Patil (2017) said that carpooling is a system that two or more individuals share their ride in a private or public vehicle. They also stated that carpooling is fundamental to decrease the use of fuel, diminish road turned parking lot amid crest hours and upgrade the parking facilities (Jadhao and Patil, 2017). Meanwhile, Zainuddin et. al (2016) stated that universities are the perfect spots for bicycle sharing frameworks because of three key issues, which are money related restrictions, air quality issues, and contracting land accessibility. Ride-sharing is viewed as an all the more environmentally friendly and practical approach to go as sharing adventures diminishes the requirement for parking spots, carbon emanations, and traffic jam on the streets (Singh et. al, 2016). Ride sharing is henceforth beneficial for riders, drivers and society. While the idea has existed for a considerable length of time, pervasiveness of computerized and portable innovation and user habituation to shared services and electronic markets have brought about specific development as of late (Teubner and Flath, 2015).

Requirements prioritization is one of the stages in requirements engineering contributing towards making good decisions for software systems. Requirements need to be prioritized due to resources constraints such as time, manpower, budget and technology (Ma, 2009). Among the basic techniques to prioritize requirements are Analytical Hierarchy Process (AHP), Numerical Assignment, MoScow technique and Kano Model (Berander and Andrews, 2005; Ma, 2009). For this research, Kano Model is selected as the requirement prioritization technique because it allows the researcher to classify the system's features depending on the value they provide to their users, which in turn would allow the developer to focus on optimizing the essential features of the system and also to recognize when certain features are unnecessary.

II. AN OVERVIEW OF THE KANO MODEL

Noriaki Kano is an Emeritus Professor, instructor, keynote speaker, a TQM master and advisor in the field of quality management (Vliet, 2013).



He invented the customer satisfaction model, which is called the Kano Model that is now widely used all around the world. According to Hogstrom et al, (2010) Kano built up a model that used specific quality characteristics and degrees of accomplishment to assess different examples of value in view of consumer satisfaction. In their research that was aimed to develop a framework capable of supporting the requirements prioritization process based on Kano Model, Nascimento et al, (2012) said the model can identify which features that most satisfy users, what will please them, and what will amaze them thus building a unique product. The diagram of Kano model by Szymczak and Kowal (2016) that resulted with attributes division into five main categories, is shown in Figure 1. A ‘Must-be’ (M) quality is a property which is unnoticeable by a client when it is fulfilled but has solid negative impact on consumer satisfaction when is not satisfied. On the other hand, ‘One-dimensional’ (O) quality refers to a quality that causes disappointment to a client when it does not meet the client’s desires, but rather positively affects fulfilment when it surpasses them. ‘Attractive’ (A) quality is a trait which can be called “bonus”, it satisfies a client when it is available, yet has no negative impact when it is not satisfied, while ‘Indifferent’ (I) quality denotes a trait that has neither positive nor negative impact on consumer satisfaction. Finally, a ‘Reverse’ (R) quality refers to an attribute which must be stayed away from customers to reach their satisfaction.

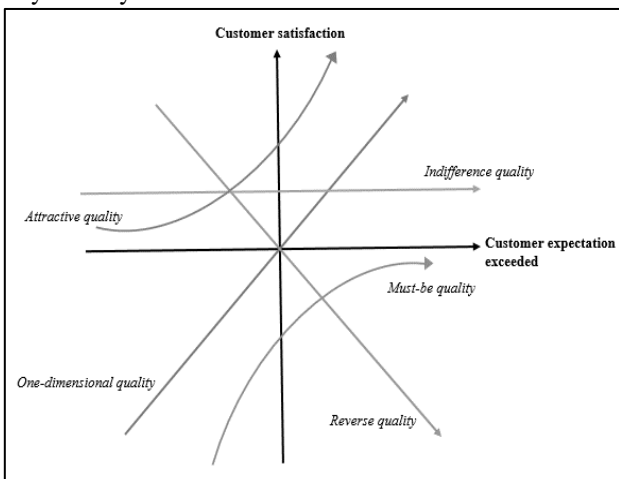


Fig. 1 Diagram of Kano Model (Szymczak and Kowal, 2016)

Requirements engineering is focused on discovering what should be developed in a system development project. Using Kano Model in prioritizing project requirements is useful to determine user needs, identify functional requirements, find concept of development and analyze competitive products.

III. METHODOLOGY

To gather requirements for the development of UiTM Share Ride mobile application, quantitative and qualitative data were collected (Yusop, Grundy and Vasa, 2016). An online questionnaire was distributed to the target respondents of UiTM students, where it had gathered ninety-one responses. The questionnaire was divided into three sections which were demographics, functionality and quality & constraints. Interview sessions were also being

conducted with nine students which have elicited more specific requirements to be included into the mobile application development. After the processes ended, the data were tabulated into a list, where a total of seventy-seven requirements have been collected. Following thematic analysis method (Sulaiman et al, 2018), requirements that have the same meaning or being mentioned more than once were grouped together and a statement was attached to it to represent a theme (Annamalai and Rosli, 2011; Kamaruddin and MdNoor, 2017). The emerging themes were then being categorized into attributes of Kano Model. Specific quality characteristics and degrees of accomplishment were used to assess the requirements in view of consumer satisfaction.

IV. RESULTS AND DISCUSSION

Categorization of customer requirements can be effectively done using Kano Model by mapping the subjects into five categories (Hsuan et al, 2016; Cheng et al, 2016). A Kano reference table for analyzing the requirements has been formulated by the researchers, where each Kano attribute was associated with certain percentage according to its importance, as shown in Table 1.

Table.1 Kano reference table for analyzing requirements.

Kano attributes	Model	Amount of percentage
Must-be		90% and above
One-dimensional		60%-89%
Attractive		30%-59%
Indifferent		1%-29%
Reverse		1% and below

Data from the online questionnaire were analyzed by calculating how many times an answer was mentioned or voted by the respondents before it was divided by the total answers to get a percentage. The percentage was then compared against Table 1 to associate it with a Kano attribute for requirements prioritization. For example, a question that asked whether respondents would like to have a choice for the type of vehicle they are sharing, being answered ‘Yes’ by 97.8% of the respondents. Thus, a requirement theme of ‘Pick type of vehicle’ was created and prioritized as ‘Must-be’ based on the Kano Model. Table 2 shows all the functional and non-functional requirements that had been gathered and its related Kano Model attributes.



Table. 2 Analysis of requirements

Functional Requirements			
No.	Requirements	Theme	Kano Model
1.	Choice for what vehicle that you're going to share with	Pick type of vehicle	Must-be
2.	Can pick bigger size of car		
3.	No choice for what vehicle you're going to share with	No choice of the type of vehicle	Reverse
4.	Able to estimate exact cost of journey (fuel, toll)	Cost of journey	One-dimensional
5.	The total cost of journey will be separated between the person who share the ride		
6.	Calculate how much is the cost of journey		
7.	Calculate price		
8.	Don't not mind sharing phone number on the mobile application	Include contact number of the one who offer ride on the mobile application	Attractive
9.	Prefer to be contacted only using the mobile application		
10.	Estimated minutes of driver to arrive	Notify when driver is near and has arrived to pick up	Indifferent
11.	Notify when driver has arrived		
12.	Can automatically detect how many drivers available near our location		
13.	Expected time arrival (ETA)	Expected time of arrival to destination	Attractive
14.	Estimate time to arrive		
15.	Get to know the expected time of arrival		
16.	Able to contact the driver	Able to reach the driver on the mobile application	Must-be
17.	Can call the driver		
18.	Able to write notes to the driver on the app		
19.	The contact part		
20.	Can chat with the driver		
21.	Get to contact the person straight away using mobile application		
22.	Can detect the current location	Detect current location	Indifferent
23.	Can pin the current location		
24.	Can set certain location as favorite so next time it took less time to state the pick-up/drop off location	Setsome location as favorite	Indifferent
25.	Get to know estimation of price before confirming ride	Price shown before confirming ride	Indifferent
26.	Can see the estimated price		
27.	Able to pay for the ride of other people	Pay for other people	Indifferent
28.	Can rate the driver	Rate the driver	Indifferent
29.	Driver rating		
30.	Can redeem points collected	Redeem points	Indifferent
31.	Knowing the person we are going to share the ride with	Show the person we share ride with	Must-be
32.	Include map in the mobile application	Availability of map	Indifferent

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33.	Show route the driver take to reach the destination		
34.	Notify when the driver has arrived	Notification when the driver has arrived	Indifferent
35.	Show basic info and picture before allowing people to share a ride with me	Include basic information about the driver	Must-be
36.	Option to reject for safety reasons	Reject/accept the driver	Indifferent
37.	Pick driver that I like regardless of male or female		
38.	Include a panic button for the passenger to keep me secured	Include a panic button	Indifferent
Non-Functional Requirements			
No.	Requirements	Theme	Kano Model
39.	Friendly user	Easy to use and understandable interface	Must-be
40.	Sleek interface		
41.	Easy to understand and use		
42.	Interface easy to understand		
43.	Simple and easy to use		
44.	Interface easy to use		
45.	Price cheaper than taxi	Affordable price	Attractive
46.	Affordable price		
47.	Cheaper than taxi		
48.	Provide promo code	Discounts available	One-dimensional
49.	Promo code notification		
50.	Availability of promo code		
51.	Always have discounts		
52.	Constant promotions and discounts		
53.	Show price after discount	Price after discounts are calculated and shown	Indifferent
54.	Able to know the exact price		
55.	Charge at fix rate basis and no surge pricing	No surge pricing	Must-be
56.	Calculation of the cost is fix and not changing		
57.	Fix price		
58.	Fix price with no cents		
59.	Fix and unchanged price		
60.	Pay at fixed rate (price accordance to distance travelled)		
61.	Application is fast to load	Fast to load	Indifferent
62.	The application can be used worldwide	The application is available worldwide	Indifferent
63.	Colour of the mobile application is just plain black and white	Colour of the application are in plain black and white	Attractive
64.	Colour of the mobile application is purple and yellow just like UiTM logo	Colour of the application are purple and yellow	Indifferent
65.	Colour of the mobile application is in pastel colours	Colour of the application are in pastels	Indifferent
66.	Do not mind about the colour of the mobile application	Do not mind about colour of the application	One-dimensional
67.	List of menu is in grid view	Grid view of menu	Attractive

68.	List of menu is in list view	List view of menu	One-dimensional
69.	Application to be displayed in upright position	Application displayed in upright position	One-dimensional
70.	Application to be displayed in landscape position	Application displayed in landscape position	Reverse
71.	Application to be displayed both in upright and landscape position	Application displayed both in upright and landscape positions	One-dimensional
72.	The font size for the mobile application is small	Small font size	Attractive
73.	The font size for the mobile application is medium	Medium font size	Must-be
74.	The font size for the mobile application is large	Large font size	Reverse
75.	Application available on App Store	Available on App Store	One-dimensional
76.	Application available on Play Store	Available on Play Store	One-dimensional
77.	Application available as desktop version	Available as desktop version	Attractive

Based on the result, the researchers have decided to select all requirements that fell under the attributes of ‘Must-be’ and ‘One-dimensional’ to be incorporated as features of the UiTM Share Ride mobile application as they were the ones deemed most important by the users. Also, some of the requirements that fell under the attributes of ‘Attractive’ and ‘Indifferent’ were also being included as features of the application as they may incite user’s satisfaction. This can be better confirmed in the User Acceptance Test phase after development of the application completed. However, requirements that fell in the ‘Reverse’ category were avoided by the researchers because they were the least desirable by the users. Finally, a use case diagram was drawn to demonstrate the selected functionalities of UiTM Share Ride mobile application, as shown in Figure 2.

V.CONCLUSION

This research was conducted as part of a larger project to develop the UiTM Share Ride mobile application. It was focused on gathering and analyzing requirements for a mobile application that was aimed to satisfy the users’ needs. Kano Model was used as a tool to prioritize requirements as it provided a method to decide which features or requirements to be incorporated in the application. It also helped the researcher to filter out those requirements that will not fulfill the users’ needs or that have no value to the users in the software development process, thus, enhancing the quality of the requirements (Hussain et. al, 2015). Future works will be done to design and develop the mobile application, followed by a testing phase to validate the requirements gathered in this research.

ACKNOWLEDGMENT

The authors would like to thank the Faculty of Computer and Mathematical Sciences, Universiti Teknologi MARA for their support on this research.

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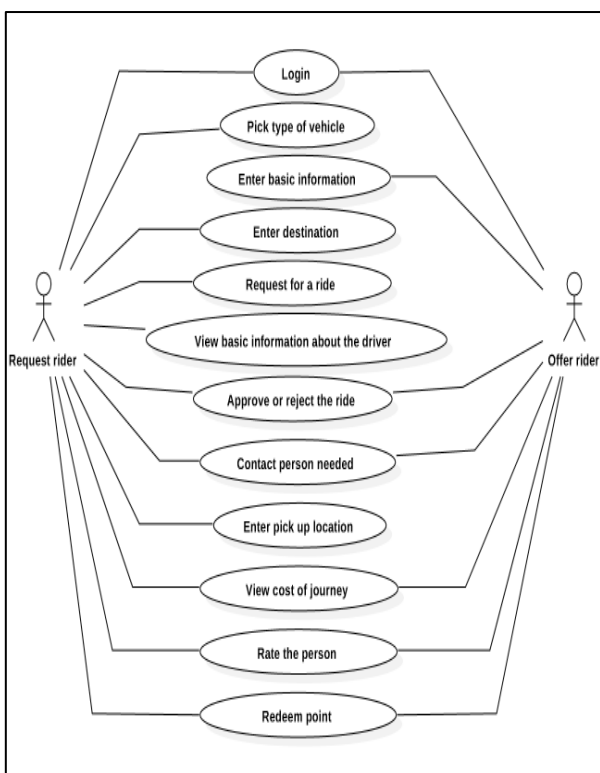


Fig. 2 Use case diagram for UiTM Share Ride mobile application

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