

MOBILE APPLICATIONS FOR FACILITIES MANAGEMENT INFORMATION

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Abstract

People are becoming more dependent on mobile phones to conduct everyday routine activities such as reading, shopping, and learning, as well as complaining. More innovative design mobile applications have been created by mobile application developers. The increment of complaints from a citizen regarding public facilities problem causes the lack of strategic communication between authorities and citizens. Therefore, this study aims to evaluate the usability of existing mobile applications that are being used by the government, namely, i-Tegur and e-Taman, for better communication performance between authorities and citizens. The usability elements, learnability and ease of use, and the features between i-Tegur and e-Taman, were compared. Other usability elements are proposed for evaluating the usability of mobile applications for complaints relating to facilities management and for developing new mobile applications with excellent usability. The usability of mobile applications evaluated by the System Usability Scale (SUS) Questionnaire and the usability score calculated by using SUS Application. Results indicate both mobile applications have slightly different usability score but still in an acceptable usability range. Both mobile applications have high learnability and are easy to use. Furthermore, e-Taman has more advantageous features than i-Tegur. In a future, facilities management complaints need to upgrading from time to time.

Keywords-- Mobile application, facilities management

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INTRODUCTION

Nowadays, because of the conventional method, the increment of public complaints regarding public facilities creates new problems for the authority, causing the lack of strategic communication between authorities and citizens. Therefore, mobile applications are widely used facilities management complaints in private sectors as well as in government sectors. However, the use of mobile applications has its own drawbacks in terms of their usability, efficiency, and reliability. Hence, this study focuses on mobile applications' usability. The scope of this study involved mobile applications being used exclusively by the government, namely, i-Tegur and e-Taman, and Johor, Malaysia as the location area for the case study. The usability of i-Tegur and e-Taman was evaluated, and a comparison of usability elements that are learnability and ease of use and comparison of features between these two mobile applications are made. Furthermore, the recommendation for improvement usability of i-Tegur and e-taman mobile applications and for developing new mobile applications is made by proposing other usability elements.

The government is improving the quality of its public services and participation in the information administration. By providing efficient and effective online services to citizens and businesses, thus information technologies expansion is expected to transform the way in which the government works. Hence, as seen to be the solution to this problem, several applications can be downloaded from phone. The implementation of online services will bring a positive impact to many parties, including are the public, businesses, and the government itself. To ensure

the success of the implementation of online application, the government should create awareness of the benefits of online services to the citizens (Ahmad, & Othman, 2007). One of the advantages application is its mobility, in which the public can make reports anytime and anywhere (Firdaus, Irwansyah, & Djaja, 2016). Even though there are a lot of applications available in the world, however there are a little application for facilities management that are efficient. Therefore, this study is to identify the best module in facilities management application in Malaysia. The mobile application developed must achieve users' satisfaction in order to make the application successful. If the application does not reach users' expectation, users may uninstall or abandoning the applications. Fig. 1 shows the reasons users abandoning or uninstalled applications. From the figure, it shows that the highest percentage of users abandoning application is because they do not need it anymore and the second highest percentage of users abandoning application is due to found another alternative. So, the mobile applications that has been use by the government and citizens must achieve user satisfaction in order to make sure excellent communication between government and citizens.

A major issue of using a mobile application is in term of usability. Usability has becoming more recognized as a significant quality dimension to determine the success of mobile applications (Baharuddin, Singh, & Razali, 2013). A successful mobile application should achieve the usability expected by the users.

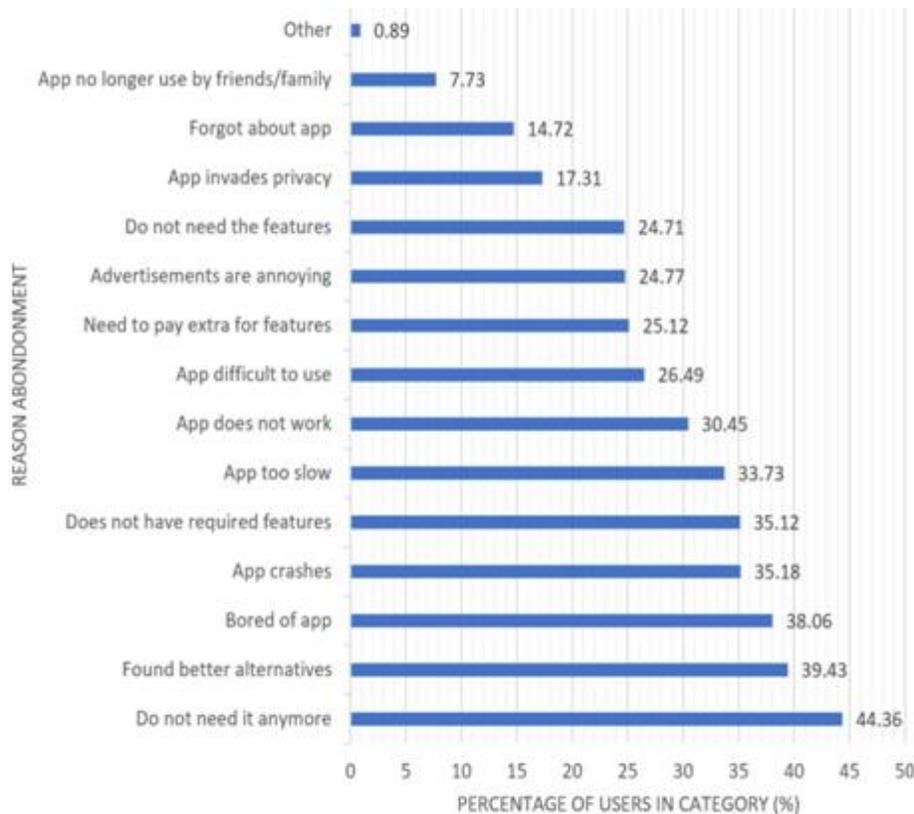


Figure 1. Reason for abandoning application (Lim, Bentley, Kanakam, Ishikawa, & Honiden, 2015)

LITERATURE REVIEW

Mobile Applications in Government, Health, and Education

Mobile applications have been used in many fields such as the government, health, and education. The uses of mobile applications in the government field can be seen through Quick Response of Public Opinion (CROP). CROP are available in web desktop and mobile internet applications (Kustiwa, & Triputra, 2017) and (Hussain et al., 2016). Jakarta Provincial Government implements Qlue, a mobile application for managing public complaints in which citizens can submit their complaints without worrying about being rejected by the officials or facing a public bureaucracy (Puristia, Kurniawan, & Lukman, 2017). Qlue enables users to complain about anything related to public services, and there are 24 public service-related topics or categories.

Other than that, Jakarta also uses the CROP application to respond to public complaints (Ziadi, Supriyono & Wijaya, 2016). CROP functions are to process reporting, monitor aspirations, complaints, and complaints of citizens who are captured through Qlue application. CROP also serves as a distribution channel for work to be followed up by officers and as a monitoring tool for the performance of officers in the provincial government of DKI Jakarta (Kustiwa, & Triputra, 2017).

One of the mobile applications in the health field is Mobile health, which is used for medical purposes through smartphones and tablets (Hamel, Cortez, Glenn Cohen, Kesselheim, 2014). The greater efficiency and improvements in quality of healthcare are led by digital services. eCAALYX is another mobile application in the health field. It is an Android smartphone application that receives input from a BAN (a patient-wearable smart garment with wireless health sensors) and GPS (Global Positioning System) location sensor and enables communication with a remote server accessible to healthcare professionals who are in charge of the remote monitoring and management of older

patients with multiple chronic conditions and over the internet (Boulos, Wheeler, Tavares, Jones, & Kamel Boulos, 2016).

One of the mobile applications in the education field is Google Classroom. Google Classroom is an online classroom that allows participants in the group to communicate, view presentations or videos, interact with other participants, and engage with resources in work groups (Iftakhar, 2016). Another application is Edmodo, which makes the educational environment accessible to both teachers and learners and also to parents from any place at any time. Edmodo is used to create a safe environment in many respects such as cooperation, feedback, and customized learning (Durak, 2017) and (Jauhar et al., 2015). There are tremendous of application online in application, however little study was search for facilities management module and its efficiencies in Malaysia.

METHODOLOGY

Method for Assessing the Usability of Product or Services

The usability survey method available in the market was recognized to measure the usability of mobile applications, i-Tegur and e-Taman, that are being used by the government for public facilities management complaints. SUS was chosen as a usability survey method. A set of questionnaires in SUS was then distributed to the targeted respondents who were the experts to answer the questionnaire for the SUS score. The respondents are from authorities' workers, Department of Public Complaints and City Planning and Landscape. The discrepancies for both mobile applications from the survey were then recognized to evaluate the usability of i-Tegur and e-Taman, resulting in the SUS score. SUS score can be calculated manually, but in this study, the SUS score was calculated by using SUS application. The discrepancies of usability elements between mobile applications and other usability elements that existed were integrated as references for developing a new mobile application for facilities management complaints.

There are questionnaires set available to measure the usability of products or services. System Usability Scale (SUS) is a questionnaire that consists of 10 questions as in Fig. 2 (Tullis, & Stetson, 2004). There are a few advantages of SUS that are relatively quick and easy for study participants to complete and for administrators to score because it is composed of only 10 questions; is cost-effective; can be used by a wide range of group

of usability practitioners to evaluate almost any type of user interface, including websites, cell phones, interactive voice response systems (both touch-tone and speech), and TV applications; and is relatively easy to understand by a wide range of people because the result is single score (Bangor, Kortum, & Miller, 2009).

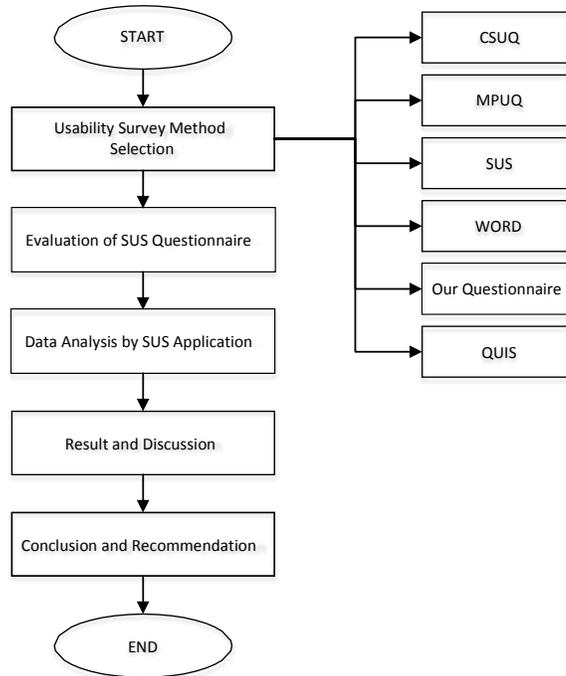


Figure 2. Flowchart of System Usability Scale

The other questionnaire is Mobile Phone Usability Questionnaire (MPUQ). MPUQ was designed to help in decision making in competing for phone variations in the end-user market, developing prototype alternatives during the development process, and evolving versions of a phone during an iterative design process (Nayebi, Desharnais, & Abran, 2012). It is a typical decision-making method by calculating the average score of all 72 questions (Ryu, Babski-Reeves, Smith-Jackson, & Nussbaum, 2007) and (Islam et al., 2016). Based on the literature review, it is shown that MPUQ was more of decision making purpose.

Questionnaire for User Interface Satisfaction (QUIIS) is also one of the questionnaires used to measure usability. QUIIS is a questionnaire composed of 27 questions, and it was developed at the University of Maryland, in which each question is a rating with a 10-point scale (Tullis, & Stetson, 2004). QUIIS was designed to assess the subjective satisfaction of users with specific aspects of the human/computer interface (Harper, & Norman, 1998).

Computer System Usability Questionnaire (CSUQ) is a questionnaire composed of 19 questions, and it is developed at IBM (Tullis, & Stetson, 2004). It is only used to evaluate usability of a computer system that is not suitable for this study. The next questionnaire is Words (adapted from Microsoft's Product

Reaction Cards). This questionnaire is based on the 118 words in which each word was presented with a check box and the user was asked to choose the words that best describe their interaction with the website, and respondents are free to choose as many words as they wanted. Last is our questionnaire, which had been used for several years in testing the usability of websites composed of nine statements to which the user responds on a seven-point scale from "Strongly Disagree" to "Strongly Agree".

Fig. 3 shows the steps of using the SUS Application in order to determine and analyze the usability of mobile applications. From the flow chart, it shows that the mobile app only can be downloaded in app store. Then, SUS Application can be used immediately without the need of sign up or log in. Firstly, when opening the app, the home page shows "Add a New Product" and click it to insert the information needed about the mobile applications that we wanted to measure the usability. Secondly, click "Create" button and the name of the mobile application will appear on the main page. After that, click the mobile application's name and click "Add a New Participant" button. Insert the participant ID and experimenter notes if necessary. Next, click "Continue" and "Start". Insert respondents' answer for each of the 10 questions regarding usability. Lastly, click "Confirm" and "Continue" to review the scores of each participants and questions.

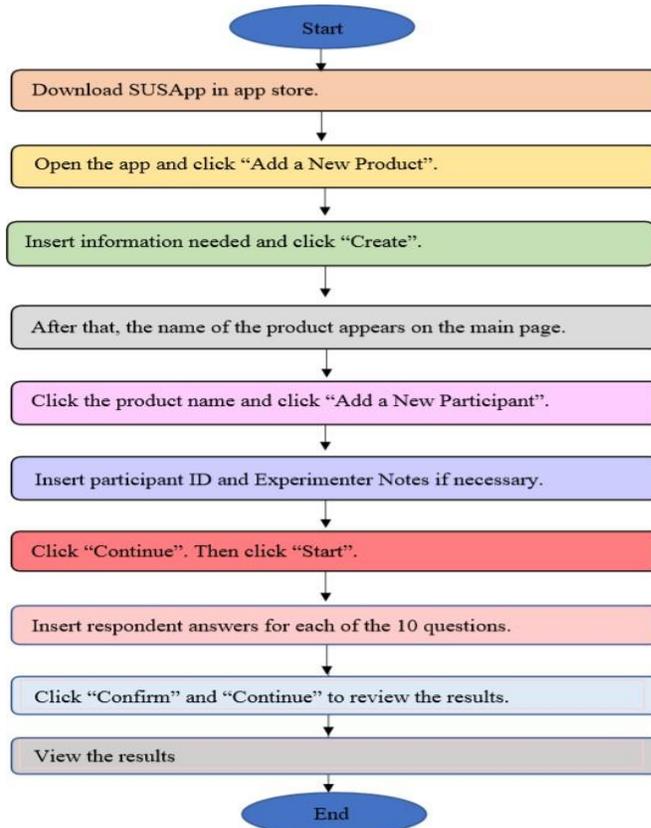


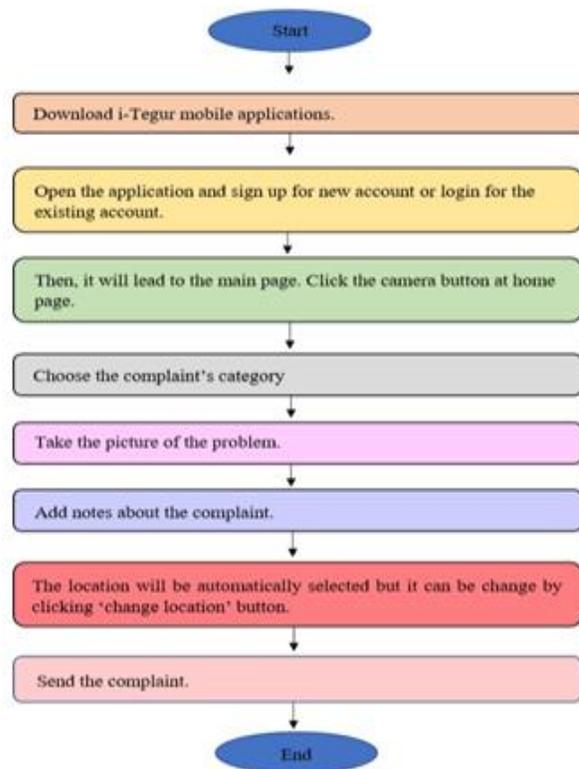
Figure 3. Steps to SUS Application

Fig. 4a shows steps of using i-Tegur. The application can be downloaded from Applications Store or Google Play Store without any additional charged. Then, the application can be freely use to complaints any problems related to housing area such as parking, potholes and many more. To use the application, just click the application and login or sign up by using email. After the login or sign up done, it will show the main page that contain information about the application and also a symbol of camera button. To start the complaint just click the camera button and continue taking the problem's picture. Then, choose the category of the complaints whether it is in parking's category, traffic light's category and many more categories that are available. Next, add notes which are the details about the problem. Location of the complaints automatically selected because of the usage of GPS but user can still change the location. Next, send the complaint. After the complaint had been made, user will receive a pop-up notification about their complaint has successfully made. Then, user can see the list of the complaints that the user's made and user also can see whether the complaints has been taken care of by the authorities or not. Lastly, user will receive a message from authorities involved.

Fig 4b shows the steps of using e-Taman to report public facilities specifically about park. Under e-Taman, user need to use SISPAAs in order for their complaints to be updated to e-Taman web application. If using e-Taman native application, user can directly use the native application to report but for the meantime only web application that fully developed. Firstly, user need to browse such as mdpontian.spad.gov.my to reach to the SISPAAs. Then, user need to sign up for new account registration and the user that already have an account they just need to log in.

After that, user can start to report by click the "New Feedback" button. After clicking the button, a page that contain information needed for the report such as type of complaints, subject, details, expected result, category and location of the complaint. Then,

user can add attachment to the complaints which is pictures. After done key in all of that, user need to tick the declaration that all the information that the user made are all correct and true.



4a

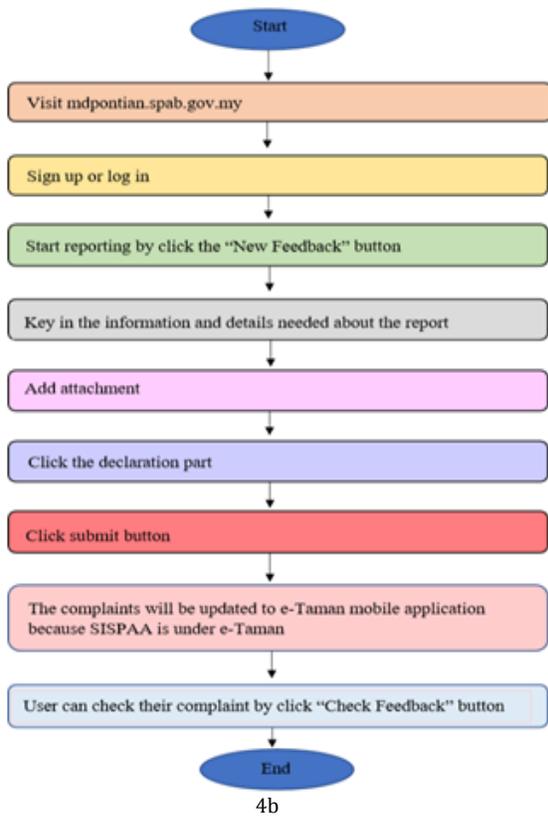


Figure 4. (a) Flowchart of i-Tegur; (b) Flowchart of e-Taman
 Next click “Submit” button. The successful complaint will be updated in e-Taman application for further action. User also can check the complaints whether authority area already takes action or not by click the “Check Feedback” button.

RESULTS AND DISCUSSION

i-Tegur Mobile Application

i-Tegur is a traditional application system provided by the government to the citizens in reporting housing area problems. To use the i-Tegur system, three terms must be followed by users. The first term is that users must use a smartphone with iOS or Android mobile operating system only.

Otherwise, the application cannot be downloaded as it supports only the aforementioned mobile operating systems. The next term is that GPS must be activated to locate the problem. To fix the problem, its location is important for PBT. The last term is the mobile communication standard. To achieve the best performance of the i-Tegur mobile application, High-Speed Downlink Packet Access of 3.5G/H above 3G – 3G, H – 3.5G, and H+ – 3.75G and LTE – 4G is required.

i-Tegur can be downloaded in a mobile application store formerly known as iKepoh. The application was officially launched by 7th Prime Minister Tun Dr. Mahathir Mohamad and KPKT in December 2018. It is designed to connect the public to the local authorities, particularly in filing complaints or bringing up issues affecting their residential areas.

The objectives of i-Tegur are to establish rapport between PBT and citizens by providing users a customer-friendly complaints platform and to help PBT in monitoring and managing complaints effectively. Fig. 5(a) and Fig. 5(b) shows the login page of i-Tegur mobile application

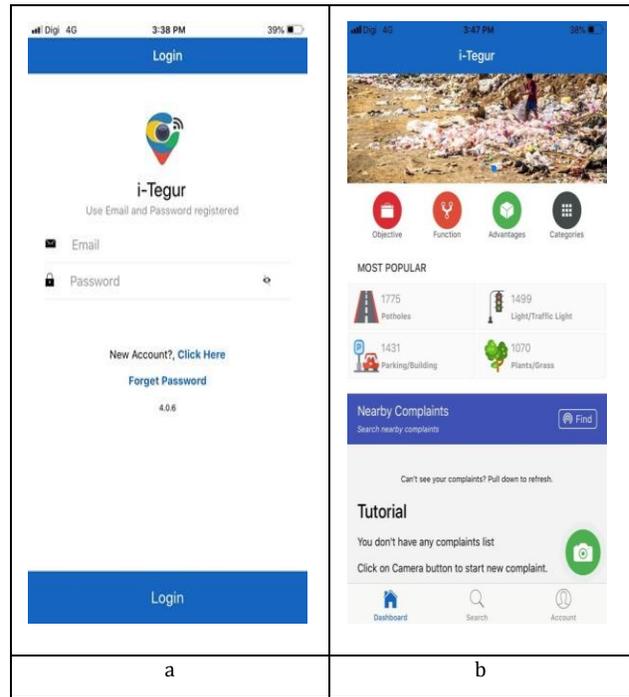


Figure 5. (a) Login page of i-Tegur; (b) Main Page of i-Tegur

e-Taman Mobile Application

e-Taman is a mobile application that develops as a web application system and QR Code developed by RN Technologies Sdn. Bhd. It is provided as a platform for parking problems, but in the meantime, only the web application can be used. In reporting park problems, e-Taman can be used by QR Code, Sistem Pengurusan Aduan Awam (SISPAA), and the link itself. If the user wanted to do the complaint by SISPAA, the user must open the SISPAA website first. By using SISPAA, it will lead the user to the e-Taman web application. The complaints through SISPAA will be updated into the e-Taman system. e-Taman web application was launched in January 2019. The e-Taman mobile application is a new application developed in accordance to upgrade the usage of SISPAA. Fig. 6(a) and Fig. 6(b) shows the login page and the main page of the e-Taman mobile application, respectively.

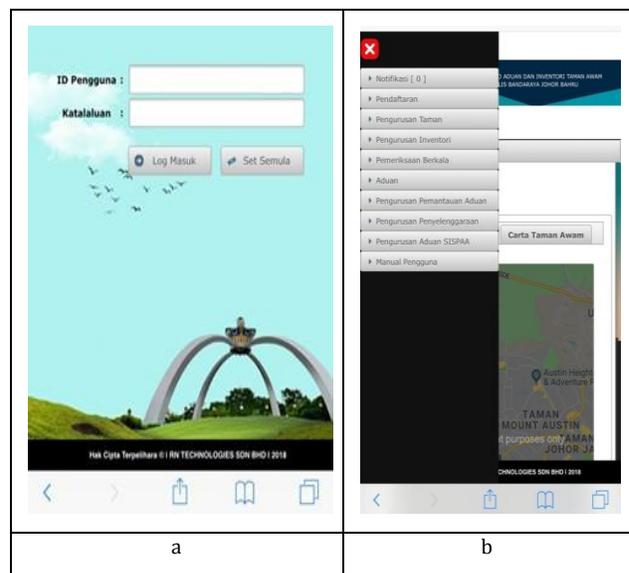


Figure 6. (a) Login page of e-Taman; (b) Main Page of e-Taman

Evaluation of Usability for i-Tegur and e-Taman

The SUS Questionnaire aimed to determine the usability score for i-Tegur and e-Taman on the basis of the average score of respondents. In general, the result for the evaluation of usability for i-Tegur and e-Taman shows an insignificant difference as can be seen in Table 1. The score of each respondent and the average score of each respondent for both mobile applications. The table compares an overview of usability scores for i-Tegur and e-Taman. i-Tegur has a slightly higher score than e-Taman with the average scores of usability of 71.67 and 71.04, respectively.

Table I. Summary of usability score for i-Tegur and e-Taman

No. Respondents	i-Tegur	e-Taman
1	87.5	87.5
2	75	77.5
3	75	70
4	75	77.5
5	72.5	70
6	77.5	72.5
7	50	50
8	77.5	77.5
9	72.5	70
10	80	82.5
11	45	45
12	72.5	72.5
Average SUS score	71.67	71.04

Fig. 7 shows the adjective ratings, grade scale, and acceptable ranges of mobile applications based on the obtained SUS score. Based on the usability scores obtained by i-Tegur and e-Taman, it shows that the adjective rating for both mobile applications is in OK range according to SUS rating. Meanwhile, the grade scale for both mobile applications is C. Lastly, the acceptable ranges for both mobile applications are acceptable. Generally, it appears that the usability of both mobile applications is not too bad; therefore, improvement is still required. The finding suggests that both mobile applications still can be improved to achieve an A grade and become the best mobile applications imaginable. These findings may help us to understand more on the level of usability for both mobile applications.

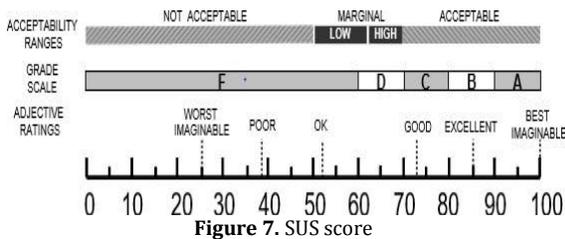


Figure 7. SUS score

The Comparison between i-Tegur and e-Taman

Based on Table 2 shows most respondents disagree with the statement of “need support from technical person” and “need to learn a lot of things before use the mobile application” for both mobile applications. It shows that both mobile applications are easy to learn. Most of the respondents agree that both mobile applications are frequently used, easy to use, quickly learned, and confident to use. Other than that, most of the respondents disagree that both mobile applications are unnecessarily complex, too inconsistent, and awkward to use. Most of the respondents strongly agree with the statement “use the mobile application frequently” for i-Tegur, whereas for e-Taman, most of the respondents only agree with the statement. The findings show that i-Tegur is frequently used compared with e-Taman, but e-Taman is well integrated compare to i-Tegur. For the quality issues of ease of use, most of the respondents think that both mobile applications are easy to use. The overall response to the SUS Questionnaire was very positive for both mobile applications.

There are several possible explanations for these results. A possible explanation for this might be because both mobile applications are very simple. It seems likely that simple mobile applications lead to ease of users learning how to use mobile applications. Another possible explanation is that most respondents choose to use i-Tegur frequently compared with e-Taman because i-Tegur can be used in any Android and iOS mobile phones while e-Taman will be launching soon. Lastly, the possible explanation is that most respondents strongly agree that e-Taman is a very well-integrated mobile application compared with e-Taman because it is the newest mobile application used for complaining to authorities about issues in public facilities.

Table II. Summary of a frequent answer for each question in the SUS Questionnaire

Usability elements	SUS questions/statements	Scale that was chosen by most respondents	
		i-Tegur	e-Taman
Learnability	Need technical support to use the applications	2	2
	Need to learn a lot of things before using the applications	2	2
Ease of use	Frequently use	5	4
	Easy to use	4	4
	Various function well integrated	4	5
	Learn quickly	4	4
	Confident to use	4	4
	Unnecessarily complex	2	2
	Too much inconsistency	3	3
	Awkward to use	2	2

1 = Strongly Disagree, 2 = Disagree, 3 = Neutral, 4 = Agree, 5 = Strongly Agree

A preliminary assessment has been done by applying both mobile applications at Johor, Malaysia. Based on the assessment, a features comparison between these two mobile applications can be summarized by comparative analysis of advantages and disadvantages for both applications. Both mobile applications are simple and easy to use. i-Tegur can be used only in native application, whereas e-Taman can be used in the web application and QR Code. A native application can be downloaded at mobile application stores, whereas web application can be used in many platforms such as Google Chrome, Mozilla Firefox, and Internet Explorer. i-Tegur has specific categories of complaints, whereas e-Taman does not include. Although i-Tegur has specific categories of complaints, such categories are still limited. Both mobile applications have a location, but from the preliminary study, it shows that the location of i-Tegur is less accurate than that of e-Taman. Table 3 shows e-Taman has more advantages than i-Tegur such as e-Taman is very well-integrated compared with i-Tegur.

Table III. Summary of positive and negative features between i-Tegur and e-Taman

Characteristic	i-Tegur	e-Taman
Positive	Simple and easy Have categories that made easier for the user to complain	Simple and easy Available in the web application and QR Code Location more accurate
Negative	Location less accurate Limited categories Only available in native application	Does not have specific categories of complaints

CONCLUSION

The result of this study indicates that both mobile applications, namely, i-Tegur and e-Taman, used for public facilities management complaints, which are within the acceptable range. The comparison between i-Tegur and e-Taman based on the usability elements in SUS indicates that both mobile applications have high learnability and are easy to use. Besides, e-Taman has more advantageous features than i-Tegur. Lastly, for facilities management complaints, other usability elements are proposed as references to propose upgrading facilities management in the future.

SUS questions only covered the usability elements of learnability and ease of use. Other usability elements, including satisfaction, overall reaction to the software system, screen factors, terminology and system information, system capabilities, system usefulness, information quality, interface quality, helpfulness, control compatibility, consistency, flexibility, minimal action, minimal memory load, perceptual limitation, user guidance, effectiveness, overall ease of task completion, satisfaction with completion time, satisfaction with support information, easy navigation, ability to find, familiarity, need, and appeal, also need to be considered to create best mobile applications imaginable for the users who are citizens and the government. Moreover, other usability elements are also important to successfully evaluate the usability of mobile applications. A further study that takes into account the other usability elements will need to be undertaken since mobile applications used for facilities management complaints are important to solve problems in strategic communication between citizens and the government.

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