Usability testing of an android application of tractor distribution information system (GIS Tractor)

Andi B Kresna¹²*, M Achmad ³, Iqbal ³ and A P Hanifa⁴

¹Batangkaluku Agricultural Training Center, Agricultural Human Resource Extension and Development Agency, Gowa South Sulawesi, Indonesia
²Alumni of Agricultural Engineering Magister Program, Faculty of Agriculture, Hasanuddin University, Makassar, Indonesia
³Agricultural Engineering Program, Faculty of Agriculture, Hasanuddin University, Makassar, Indonesia
⁴South Sulawesi Assessment Institute for Agricultural Technology, Makassar, Indonesia

E-mail: akrisna5@gmail.com

Abstract. An android application for tractor system information, namely GIS Tractor, was launched recently. As a new application, it needs usability testing as a part of an assessment. Usability level can affect the ease of use of an application. This study was conducted to measure the acceptability of GIS Tractor based on USE questionnaire evaluation (Usefulness, Satisfaction, and Ease of Use). Online questionnaires are used as a research instrument constructed as five-point Likert rating scales to rate a set of statements. The results showed that GIS Tractor had met the five aspects of usability testing. The use of the GIS tractor android application can assist the user in locating the distribution of tractor within Maros Regency faster than the manual system.

1. Introduction

Big data is the latest agricultural issues and trends that can provide alternative solutions, for instance, the use of information technology in the digital age. The need for geographic information system (GIS) software designed for research in precision agriculture is increasing [1]. The agricultural mobile application is one of the big data products for precision agriculture.

An Android-based mobile application that utilizes GIS for tractor distribution mapping is designed for mapping the distribution and movement of machinery (tractor) to replace manual systems that are not yet optimal. This application can help related agencies record the shortages and excesses of tractor distribution and manage and manage agricultural machinery assistance to farmers faster and more planned manner.

The increasing number of applications for mobile devices is challenging developers to create applications of superior quality. Many methods can be used to measure the quality of an application, one of which is usability testing. According to Aelani and Falahah [2], the level of usability is a benchmark, whether the system will be helpful, acceptable to users, and last long in the market [3]. The user interface provides a mechanism for the user to interact with the application. Good design of the
user interface is an essential part of creating an application. Applications made must be user-friendly to find it easy to learn and use these applications [4].

The Maros Tractor GIS application is a tractor distribution information system in Maros Regency. This application was released in mid of 2020 and has never been evaluated for usability before. Usability evaluation is carried out to improve user experience to be accepted and used efficiently by users. Testing the acceptance aspect of usability is carried out by filling out the questionnaire to support the data and will be further processed to conclude the study. Usability testing can be a benchmark if the system would be helpful, acceptable, and last long in the market [3].

This research focuses on testing the user interface of the Maros Traktor GIS application using Usability testing. This research is limited to Usability Testing using the USE Questionnaire on the GIS Tractor Maros application

2. Methods

2.1. Respondent
The respondents were 25 persons, consisting of agriculture extension officers and trainers chosen based on participatory sampling.

2.2. Instrument
The instrument used for analysis was a questionnaire survey given to the interested participants through a Google form link filled out online. It consists of 13 questions reflecting the app's usability, including ease of use of the application and its appearance. The questionnaire's measurement was carried out using a Likert scale divided into a scale of 1 to 5 level, as explained in table 1.

| Question/statement | Very difficult | A bit difficult | Quite Easy | Easy | Very easy |
|--------------------|----------------|-----------------|------------|------|-----------|
| Score              | 1              | 2               | 3          | 4    | 5         |

Usability testing percentage formula [10]:

\[
\text{Testing percentage} = \frac{\text{Total score}}{\text{Maximum score}} \times 100\%
\]

3. Results and discussion
The usability test of a smartphone application is mainly carried out by the most common usability testing tool in development practice [5]. Usability is a qualitative analysis that determines how easy the user is to use an application interface [6]. An application is called usable if its functions can be executed effectively, efficiently, and satisfactorily. The initial step of usability testing is to provide some tasks prepared in advance to the user when interacting with the system tested. These tasks were given to 25 respondents from agriculture trainers and extension officers familiar with Android OS (table 2). These tasks are used as a means of interaction in measuring usability [7].

| No  | Task                                                                 |
|-----|----------------------------------------------------------------------|
| 1   | Open play store from your android                                     |
| 2   | Find and download GIS Tractor from the Play Store                     |
| 3   | Register your email account and create a password                     |
| 4   | Use the farmer group meu to see tractor deployment                    |
| 5   | Choose some pinpoint location of the desired tractor                  |
| 6   | Use the Google map direction to get the route to tractor location     |
|     | with active GPS                                                       |
The questionnaire is given to respondents who have done the above tasks to gain user experience with the application display being tested. The questionnaire contains 13 questions that represent the five aspects of usability. According to [6], usability testing elements include five things: Learnability, Efficiency, Memorability, Errors, and Satisfaction. Each question in the questionnaire aims to show the level of usability according to user acceptance which will be assessed on a scale of five [8,9]. The average scores of each question/statement are calculated to measure the usability score and check if the five aspects of usability testing have been met.

3.1. Respondent information

3.1.1. Age. Age distribution of respondents (figure 1) is dominated by age 41-50 years old (9 respondents), followed by 31-40 years old (8 respondents), 20-30 years old (5 respondents), and >50 years old (3 respondents).

![Figure 1. Age group distribution of the respondents.](image1)

3.1.2. Gender. As much as 68% of the respondents are males (17 people), the rest are females (8 respondents) as shown in figure 2. Since the survey is based on participatory, the distribution of age and gender were not controlled.

![Figure 2. Gender distribution of the respondents.](image2)
3.2. Android mobile brand

The result showed most android mobile brand was Samsung (9), followed with Xiaomi (6), Oppo (5), Huawei (1), and other brands (4). The result confirmed that the GIS Tractor application compatible with most android mobile brands with a different range of android versions (4.0 to 10.0) as shown in figure 3.

![Figure 3. Respondents’ android brand of distribution.](image)

3.3. Network provider

Telkomsel was the most used cellular network provider in the survey. Only three remaining respondents used other networks. Android phones used the internet from the cellular network, which often comes in many package options. The network provider is an essential factor for a smooth run of the android application besides the wi-fi connection. The user often chooses the particular network provider due to the better coverage in rural and remote areas. Superior network providers in one place might not be similar to others. Further testing may be required for loading time, total page size, and internet speed (figure 4).

![Figure 4. Respondents’ cellular network.](image)
3.4. Usability testing analysis

Results in Table 3 showed that the average scores were ranged from 3.64 - 4.16. It means that most respondents rated good for all aspects of the USE questionnaire. The lowest score was found in the question about how easy is the application to use. Meanwhile, the highest score was how easy is the logging out process.

Table 3. Usability score of GIS Tractor android application.

| No | Question/statement                                                                 | Average score |
|----|------------------------------------------------------------------------------------|---------------|
| 1  | Is the GIS Tractor application and easy to be recognized/ found in Play Store?     | 3.71          |
| 2  | Is it easy to operate?                                                             | 3.64          |
| 3  | Is the interface attractive?                                                       | 3.84          |
| 4  | Is it easy to download                                                             | 3.96          |
| 5  | Is it easy to register                                                             | 3.84          |
| 6  | Is it easy to log in                                                               | 3.92          |
| 7  | Are the menu display and functions easy to understand                              | 3.80          |
| 8  | If the font and symbol in the application menu easy to read                        | 4.12          |
| 9  | Is the map’s direction to the tractor location easy to be accessed?                | 3.88          |
| 10 | Is the logging out easy                                                            | 4.16          |
| 11 | Are the menu and page view easy to remember                                       | 3.88          |
| 12 | Is the available menu met the need/requirement                                    | 4.04          |
| 13 | Is the information security aspect appropriate                                    | 3.92          |

Regarding usability, the GIS Tractor has a reasonable rate on all usability aspects, i.e., learnability, efficiency, memorability, errors, and Satisfaction. It was represented from the score of usability result on five attributes as follows.

a. The question of “Is the GIS Tractor application and easy to be recognized/ found in Play Store? I got a score of 3.71, which showed the GIS tractor has a Learnability aspect.
b. Is it easy to operate? The application got a score of 3.64, which showed that the application met the efficiency aspect.
c. Question number 11 got a score of 3.88, showed that the application met the memorability aspect.
d. Question numbers 7 and 8 scored 3.80 and 4.12 each, representing the minimalizing the Errors aspect.
e. Question numbers 12 and 13 were represented the aspect of satisfaction of the GIS Tractor application.

The calculation of the testing percentage is provided in Table 4. The highest rate was found in question/statement 10 about logging out. On the contrary, the lowest rate was found in question/statement 1, whether GIS Tractor can be recognized/found in Play Store. It may indicate that the desktop/icon of the GIS Tractor needs to be improved for better recognition by changing the colour combination or eye-catching logo. Overall, each percentage for the questionnaire is acceptable and indicates a good result of testing.
Table 4. Usability testing percentage.

| No | Question/statement                                      | Total score | Maximum score | Percentage |
|----|---------------------------------------------------------|-------------|---------------|------------|
| 1  | Is the GIS Tractor application and easy to be recognized/ found in Play Store? | 89          | 125           | 71.2       |
| 2  | Is it easy to operate?                                  | 91          | 125           | 72.8       |
| 3  | Is the interface attractive?                           | 96          | 125           | 76.8       |
| 4  | Is it easy to download                                 | 99          | 125           | 79.2       |
| 5  | Is it easy to register                                 | 96          | 125           | 76.8       |
| 6  | Is it easy to log in                                   | 98          | 125           | 78.4       |
| 7  | Are the menu display and functions easy to understand  | 95          | 125           | 76.0       |
| 8  | If the font and symbol in the application menu easy to read | 103         | 125           | 82.4       |
| 9  | Is the map’s direction to the tractor location easy to be accessed? | 97          | 125           | 77.6       |
| 10 | Is the logging out easy                                | 104         | 125           | 83.2       |
| 11 | Are the menu and page view easy to remember            | 97          | 125           | 77.6       |
| 12 | Is the available menu met the need/requirement         | 97          | 125           | 77.6       |
| 13 | Is the information security aspect appropriate          | 101         | 125           | 80.8       |

4. Conclusion

Usability acceptance by the user, the average value is above 3, so it can be said that the GIS Tractor has met the usability testing aspects.

References

[1] Zhang N, Runquist E, Schrock M, Havlin J, Kluitenburg G, Redulla C 1999 Making GIS a versatile analytical tool for research in precision farming *Comput. Electron. Agric.* 22(2–3): 221–31

[2] Aelani K and Falahah 2012 Pengukuran usability sistem menggunakan USE questionnaire (studi kasus aplikasi perwalian online STMIK “AMIK Bandung”) *seminar nasional aplikasi teknologi informasi (snati)*

[3] Kurniawan FI, Akbar RM Pengujian Usability Antarmuka Aplikasi Mangente *Seminar Nasional Teknologi Informasi dan Komunikasi 2016 (SENTEKA 2016)* (Yogyakarta: Universitas Atma Jaya Yogyakarta) pp 334–42

[4] Suharli S *Membangun Aplikasi Berbasis Windows Dengan Vb. net* (Jakarta: Elex Media Komputindo)

[5] Ahmad N, Boota MW, Masoom AH 2014 Smart phone application evaluation with usability testing approach *J. Softw. Eng. Appl.* 7(12)

[6] Kelly D 2009 *Methods for evaluating interactive information retrieval systems with users* (USA: NOW The essence of knowledge)

[7] Sastriahardja H, Hapsari IN, Neri IA 2008 Pengukuran Usability Dengan Sarana Task Model Dalam User Center Software Development *J. Penelit. dan Pengemb. Telekomun.* 13(2)

[8] Wignjosoebroto S, Sudiarjo A, Harendra D 2009 Perancangan interface prototype web berdasarkan pada aspek usability (studi kasus: Laboratorium Ergonomi dan Perancangan Sistem Kerja Teknik Industri ITS) (Surabaya:ITS)

[9] Rahadi D R 2014 Pengukuran usability sistem menggunakan use questionnaire pada aplikasi android *J. Sist. Inf.* 6(1): 661–71