

# Subjective Measurements Analysis of Usability Evaluation for Deaf People Mobile Applications

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**Abstract**—Usability evaluation is an important element that will enable to identify performance of any system or application. Through identification of these issue, usefulness of a product can be improvised. Many usability models are available to evaluate the system usability. Usability data can be collected in two different method which is objective and subjective data. This paper present subjective data analysis of usability evaluation conducted with deaf people mobile application. The results show that the application evaluated having low satisfaction score for deaf people.

**Index Terms**—Deaf people; Mobile application; Subjective metrics; Usability evaluation model.

## I. INTRODUCTION

Subjective metrics are part of usability evaluation that commonly being collected with the user after usage of the system or application [1,2,9]. Measuring these metrics enable to measure any system or application usefulness in term of performance and satisfaction. To measure system usability, commonly usability model would be referred as guideline. These models give insight on measurements to be used in collecting data for usability analysis.

Subjective metrics are normally used in measuring the satisfaction of any application that is experience by the user during usage of the application throughout the usability evaluation. Subjective measures used in form survey or questionnaire to identify score of an application by the users [3,10,11].

Application that are developed for specific targeted user need to meet the requirement of the user need to be incorporated into the application. Application will fail to satisfy the user if the requirement is absent and make it more difficult. This is common in application developed for disabled people. Different disability having different level of mental strength to understand and use system or applications [4,5,8] thus, application that developed for disabled should consider these special requirements to ensure delivery of the application.

This paper aimed in evaluating a mobile application that developed specifically for the deaf user social media to identify level of satisfaction towards the application. The evaluation was conducted by examining seven tasks and collecting twenty-six subjective metrics. Subjective metric is one of the important metric that commonly used in data collected during usability testing. Through subjective metrics, satisfaction can be identified. Section two of the paper consist of application overview and implementation of the evaluation. Section three discuss the subjective measures findings and paper is concluded in section four.

## II. BACKGROUND OF STUDY

Many studies have been conducted by researchers where usability evaluation dimensions evolved over time. Earlier [11] provides metrics for usability by developing usability models align that with ISO [12] standard which comprises of clear usability definition. ISO also strained that usability merely dependent on the user requirement about a product. [13] has elaborated usability as relying on human capability in using with easiness of a product.

Subjective measurement are one of the metric that commonly being used in usability evaluation. Mostly subjective metrics tend to focus on measurement of user satisfaction since this type of measurement are consider subjective and nonetheless difficult to be quantify.

Questionnaires are an appropriate way to collect subjective data as they are less expensive and can be distributed to a large group. Number of validated questionnaires such as System Usability Scale (SUS), Questionnaire for User Interface Satisfaction (QUIS) and Computer System Usability Questionnaire (CSUQ) are available to be chosen or develop on own [14, 15,16].

Thus, using the metrics in the developed model, this paper has conducted survey on deaf people and result are presented in next section in detail.

## III. USABILITY EVALUATION OF DEAFWORLD APPLICATION

DeafWorld is mobile application that is available for free in Android and AppleStore which is most used application store in world by mobile user [6]. This application is available on free of cost and developed specifically for the deaf people. DeafWorld application is a social media platform that connect deaf from all over the world into one application. The application is seen to have discontinued by the users and reviews received also shows dissatisfaction of the users toward the application.

Thus, DeafWorld was chosen to be used as sample application for this paper After the application has been chosen, task to be conducted during the evaluation was identified. Total of 7 task were generated according to the application as per in Table 1.

Table 1  
Task Descriptions

Task	Description
Task 1	Post video- user post any recorded video in the application
Task 2	Watch video and 'Like' – user watch any video and 'Like' the video
Task 3	Comment with emoji – user have to choose proper emoji to comment on any video
Task 4	Respond to any comment – user have to comment replying to any other user
Task 5	Search profile – user search for any other user profile
Task 6	Check notification – user have to check if there is any missed notification
Task 7	Logout- user logout from the application

Participants were chosen with convenience sampling method [7]. Malaysia Federation for Deaf (MFD) has been approach for this purpose and was offered 20 volunteer participants for this evaluation. Participant's age ranged between 18 to 30 years old due to availability and participants are deaf people who are working and studying at MFD.

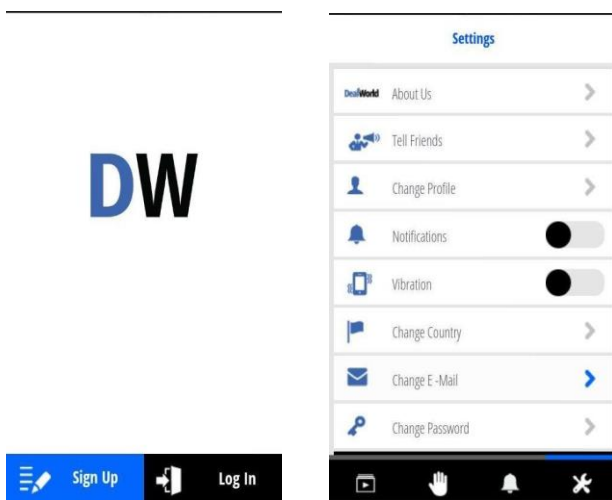


Figure 1: Interface of DeafWorld



Figure 2: Participant are briefed on the application

Participants were gathered at MFD, Selangor for evaluation to be conducted. Before evaluation started, participants were given brief introduction on the evaluation and process of what should be done throughout the evaluation. The instruction given to them through translator. Evaluation starts only after participants are clear on the evaluation and agreed the evaluation being recorded for research analysis purpose.



Figure 3: Participant are conducting the evaluation

During the evaluation, all the possible data has been collected. Total of 26 subjective metric data were collected during this evaluation. Subjective metrics listed have their own method of data collection as described in the Table 2 below.

Table 2  
List of Subjective Metrics

Subjective Metric	Subjective Metric
Satisfaction with text presentation	Satisfaction in finding contents
Satisfaction with captioning presentation	Satisfaction with menu names
Satisfaction with video presentation	Satisfaction with touchable keypad
Satisfaction with virtual keyboard accessible	Satisfaction with colour and font used
Satisfaction with menus	Satisfaction with layout presentation
Alert easy to be identified (vibration or flash lights)	Satisfaction with information organization
Satisfaction with video help provided	Satisfaction with output format
Sign language used proper to different culture	Satisfaction with multimedia (images and videos) content
Translator for sign language and text satisfying	Satisfaction with touchable menus
Application loads in the device	Sign languages used clear to understand
Easy to revert error (s)	Satisfaction with navigation structures
Sign languages display satisfying	Satisfaction with help menu provided in application (when needed)
Easiness in learning the application	Successful error rectification information satisfaction
Menu button are clear to understand	

Table 2 above shows all the 26 subjective data that was collected during the usability evaluation conducted. Data was analyzed through survey conducted with the participants after evaluation has been completed and rated on score of 1 -5; 1: Strongly Disagree, 2: Disagree, 3: Neutral, 4: Agree and 5: Strongly Agree.

Participants were asked to rate the application based on the 26-metrics listed in Table 3 to identify level of satisfaction of user towards the DeafWorld application. Findings of the subjective metric data presented in the next section

#### IV. FINDINGS

This section explains the results of the subjective metric that was surveyed after completion of tasks using DeafWorld applications. Statistical analysis conducted data

collected for all the subjective metric were analyzed using Statistical Package for Social Sciences (SPSS) and mean of each metric reported in Table 3. Mean data for subjective metrics are calculated in seconds.

Table 3  
Mean Score

Subjective Metric	Mean Score	St. Dev
Satisfaction with text presentation	2.00	0.973
Satisfaction with captioning presentation	1.55	0.887
Satisfaction with video presentation	2.25	1.118
Satisfaction with virtual keyboard accessible	3.15	1.089
Satisfaction with menus	3.40	1.046
Alert easy to be identified (vibration or flash lights)	1.55	1.050
Satisfaction with video help provided	2.15	1.4609
Sign language used proper to different culture	2.15	1.268
Translator for sign language and text satisfying	1.75	1.208
Application loads in the device	2.95	0.887
Easy to revert error (s)	1.60	0.820
Sign languages display satisfying	1.75	1.332
Easiness in learning the application	1.75	1.332
Menu button are clear to understand	2.15	1.039
Satisfaction in finding contents	3.20	1.005
Satisfaction with menu names	1.60	0.940
Satisfaction with touchable keypad	1.75	0.716
Satisfaction with colour and font used	1.75	0.966
Satisfaction with layout presentation	1.95	0.825
Satisfaction with information organization	2.10	1.165
Satisfaction with output format	3.15	1.182
Satisfaction with multimedia (images and videos) content	1.80	1.196
Satisfaction with touchable menus	3.00	1.256
Sign languages used clear to understand	2.20	1.321
Satisfaction with navigation structures	2.00	1.622
Satisfaction with help menu provided in application (when needed)	3.40	1.046

Overall the total mean for the item is 2.173 with standard deviation of 0.659 which reveals measurement items can yield appropriate results. It is also revealed that for the subjective metrics satisfaction with menus, satisfaction with virtual keyboard, satisfaction with touchable menus and satisfaction with information organization are rated medium satisfactory level which range 3.00 to 3.40 mean score. While all the other subjective metrics having low mean score obtained which ranged between 1.55 to 2.95 mean score.

This shows that user have very low satisfaction on the usage and presentation of the whole application failed to fulfil the need of the hearing-impaired despite being

declared as specific application for the hearing-impaired user. This also shows evidently on the reason why this application are not much downloaded from the application store though it address the specific disabled community and free of charge.

Overall level of satisfaction was also obtained to answer the general question; how satisfying it is to use the application for the participants? To obtain this, difference of maximum and minimum scores was obtained which was further divided by three to categorize the level of satisfaction of the user towards usage of the application into low satisfaction, moderate satisfaction and high satisfaction. Given that, the difference of 130 and 26 was 104 which is divided by 3 providing low (26.00-60.66), moderate (60.67-95.33), and high (95.34-130) levels of user satisfaction.

Table 3 shows the mean average of score obtained in subjective data that lead to the transformation of number of low and high satisfaction towards the application evaluated.

Table 4  
Participant Satisfaction Level

Participant	Mean	Satisfaction Level
Participant 1	66.00	Moderate
Participant 2	96.00	Moderate
Participant 3	52.00	Low
Participant 4	75.00	Moderate
Participant 5	79.00	Moderate
Participant 6	90.00	Moderate
Participant 7	62.00	Low
Participant 8	62.00	Low
Participant 9	52.00	Low
Participant 10	62.00	Low
Participant 11	43.00	Low
Participant 12	85.00	Moderate
Participant 13	37.00	Low
Participant 14	47.00	Low
Participant 15	52.00	Low
Participant 16	50.00	Low
Participant 17	49.00	Low
Participant 18	52.00	Low
Participant 19	54.00	Low
Participant 20	42.00	Low

According to the Table 4 above, analysis results on the participants in the research showed that average mean score ranged 37 to 96. Given the mean values of the variables, overall satisfaction was found to be at low level indicate the application yield many unsatisfactory in term of usage by the hearing-impaired.

Figure 4 shows the number of level of satisfaction

achieved by the participant in using the mobile application during evaluation. According to the figure above, 70% of participants are having low satisfaction towards the application and felt that the application failed to deliver many requirements deaf people are needing.

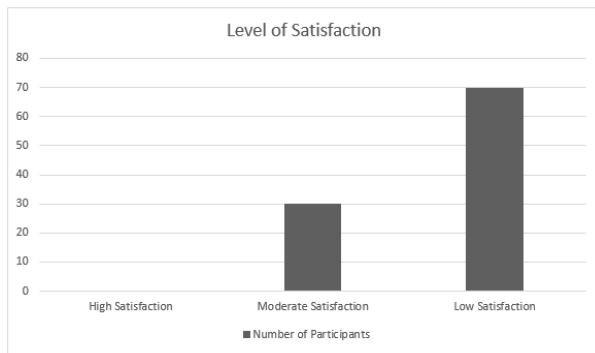


Figure 4: Level of Satisfaction

Besides that, application evaluated are also rated very difficult to be used by deaf people and many usability issues in term of navigation and interface needed to be resolved. This shows clearly the dissatisfaction participants are having towards the application evaluated.

## V. CONCLUSION

Usability evaluation for the deaf are very crucial since their requirements for mobile application are different than for non-disabled people. This paper presents the subjective metric data that has been collected and mean score has been reported. Besides that, level of satisfaction of participant were also reported. Future studies can be focused on measuring usability score for the application evaluated.

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