



Usability Test of Mental Health Application MoodPath with Software Usability Measurement Inventory

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ABSTRACT

MoodPath is a mobile application for mental health. The application uses Patient Health Questionnaire 9

(PHQ-9) and General Anxiety Disorder 7 (GAD-7) to assess mental health of its users. The study held usability test using Software Usability Measurement Inventory (SUMI) questionnaire with 27 respondents. MoodPath application got usability value of 46.26 that is Below Average in Global SUMI scales. The value is also related with every individual scale in SUMI. The Efficient, Affect, Helpfulness and Control scales have Below Average value. Only the Learnability scale has Above Average value. The usability result is reached with 95% Confidence Interval. Based on the IT skill, respondents with better IT skill gave lower usability score compared to respondent with lesser IT skill. The research also found that familiar UI and standard questionnaire (PHQ-9 and GAD-7) gave positive usability in Learnability and Efficiency scale. The research found that MoodPath application need to consider wider range of users by giving feature that not only satisfied people with lesser IT skill but also people with better IT skill. Based on the usability test, the MoodPath application may improve the usability by providing 'Remember Me' and result saving features.

1. INTRODUCTION

Mental health problem becomes a global concern, with condition such as anxiety and depression that significantly disturbing life quality [1], [2]. Teenager are considered susceptible to mental health in facing challenges like academic pressure and social media influence [3], [4]. In Indonesia, the emotional breakdown tendency for individuals above 15 years old increasing from 6% in year 2013 to 9.8% in year 2018 [3], [5]. Teenager faces unique stress stimulate, including academic demand, cultural shock and limited access to mental health institution especially in rural

areas [2], [4]. Meanwhile, initiative such as mental health program in school and national health insurance (Jaminan Kesehatan Nasional / JKN) has their own problems in stigma, lack of professional personnel and lack of evenly distributed health service [2], [5]. Comprehensive solution that include early intervention, awareness and increased service integration is really important to achieve any improvement [2], [5].

With the technology advancement, mobile application increasingly known as an effective tool instrument in supporting mental health management. This kind of applications overcome the challenge such as stigma, accessibility and offer convenience with features such as self-monitoring, psychoeducation, and peer support. For instance, PeerTech is an application in Norway that integrate self-management tool and peer interaction to empower user with serious mental health [6]. In Indonesia, Riliv and Satu Person offer mental health resource such as counselling and guided activity to increase welfare during hard time like COVID-19 pandemic [7]. These mental health applications show potential in solving the issue in mental health care using technology [6], [7], [8].

One of the mental health applications is MoodPath, designed as a companion for teenagers facing their mental health problems. The application is developed by Decomus of USM Information System. The Android-based application utilizes a standard questionnaire, commonly applied in mental health assessments, such as PHQ-9 and GAD-7. PHQ-9 is a questionnaire called Patient Health Questionnaire that used to assess depression [9], [10], [11]. Meanwhile, GAD-7 is a tool called Generalized Anxiety Disorder that commonly used to assess anxiety [12], [13], [14]. Part of MoodPath user interface is shown in Figure 1.

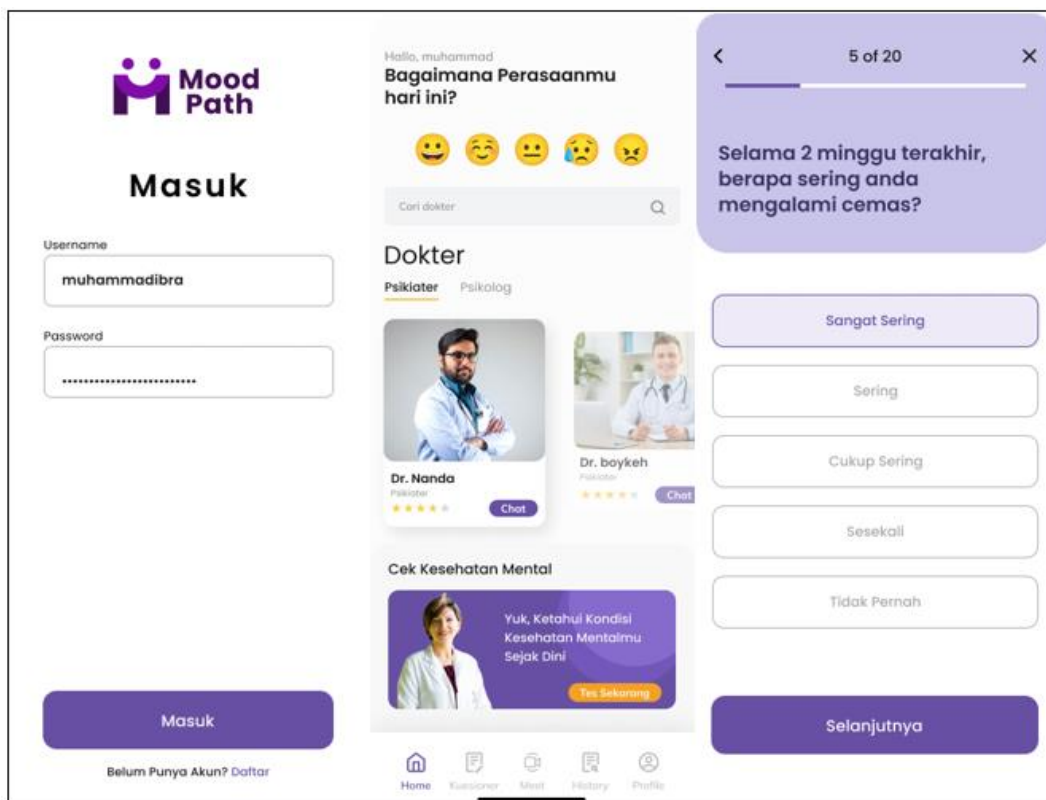


Figure 1. MoodPath application

On the other hand, it is important to measure usability of an application, whether the application is web-based application [15], [16], [17] or mobile-based application [18], [19], [20] like MoodPath. Usability is an important factor in successful system implementation. It affects user satisfaction, efficiency and adoption. Usability acts as a mediation in user experience, building trust and engagement in digital platform [21]. Even in immersive environment like Metaverse, usability still plays an important role. When the design is intuitive, the interaction and attachment of the user and the application will be immense [22]. Furthermore, when a system has complex user interface, good usability may enhance user reliability and acceptance. Measuring usability can be achieved by effectivity and satisfaction assessment [23].

PeduliLindungi is one of mobile health application within Indonesia health students, giving an effective m-health tool that is required in managing COVID-19. A study evaluated the usability of Peduli Lindungi. Unlike the previous study that assessed the usability based on general usability, this study used m-Health App Usability Questionnaire (MAUQ) to assess the application. MAUQ has 3 internal scales in measuring usability, ease of use and satisfaction, system information arrangement and usability with 7-point Likert scale as the measurement value. By using cross-sectional descriptive design, data collected from the students of Politeknik Insan Husada Surakarta and Sekolah Tinggi Ilmu Kesehatan Indonesia Jaya. The study showed that 66% student agrees that the application easy to use, 64.7% students satisfy with the interface and 55.7% consider the application useful. Reliability test confirms strong internal consistency with Cronbach's Alpha > 0.8, validating MAUQ as effective assessment tool. While the PeduliLindungi itself generally well received, some users had concern in navigation and interface. It is also suggested to enhance certain areas to increase long time interaction [24].

Research [25] tried to find the impact of COVID-19 pandemic in download and usage of popular mental health mobile applications. This research discussed the increasing demand in mental health support during the pandemic with noting the role of m-health application in providing alternative psychology treatment. This research analyzed the user download and activity data from 16 applications that mostly used and evaluating the applications quality with Mobile Application Rating Scale (MARS). The research showed that 13 of 16 applications had increased number of downloads with 11 applications enjoying more than 10% download raised post pandemic. However, while these applications got good scores in functionality and aesthetics, the applications didn't have clinical evidence and integration with professional mental health service. The research pointed out that there was gap between the applications popularity and the clinical effectivity. The research stressed the importance of evidence-based design, usability improvement and better integration with mental health treatment system.

Other work concerns with the importance of giving easily accessed digital intervention for parents with ADHD (Attention-Deficit/Hyperactive Disorder) children. These children have high dropout rate despite having traditional clinical-approved treatment such as BPT (Behavioral Parent Training). The research proposed a mobile application called ADHD Coping Card that designed to support parents by increasing the compliance in working with the homework while decreasing psychological pressure. The research used mix methods approach in usability assessment. Collecting quantitative data with SUS (System Usability Scale) and qualitative feedback from 21 Romanian parents that enlisted online. The application achieved high result in usability test with mean value 80.35 and standard deviation 11.16. Positive user experience includes application design, mood monitoring and children-parent activity. However, users suggested some improvements such as reducing the mandatory psychology assessment, integration of multimedia content and broaden the area to other children related psychological disorders. The research found the potential in digital intervention in improving parent engagement in ADHD treatment. The research also found the need of further research in broader implementation with better validation [26].

Cognitive intervention technology for elderly with MCI (Mild Cognitive Impairment) or dementia is important with consideration that digital cognitive intervention may provide accessibility, flexibility and affordability while user friendly to maintain the utility. The research [27] conducted usability and user experience (UX) test to such application. With systematic review approach, the research analyzed 10 research from database like Medline, PubMed, Scopus, ScienceDirect and PsycINFO with focus to stimulate technology in cognitive, exercise and rehabilitation. Most intervention technology used is computer-based application with serious game format. Usability is measured by the effectiveness (task completion), efficiency (time/resource consumption) and UX (satisfaction, engagement, motivation). The study show that elderly users need more time (45%) and help (40%) but still able to complete the task (60%). The result achieved with positive UX feedback while there are some interface challenges. The research concluded that integrating usability and UX assessment very important in developing effective cognitive intervention technology and suggesting standardized assessment tool. The research also gave note in larger inclusivity towards elderly user in usability assessment.

PeerTECH is a mobile health application, designed for SMI (Serious Mental Illness) self-management in Norwegian community of mental health management. Understanding the importance of usability test in digital health instrument, this previous research is held with aim to identify the driving and inhibiting factor in adopting such applications. With Think-Aloud method, task analysis and semi-structured interview, data collected from 11 respondents including individuals with SMI, peer support workers and mental health professionals. The research shows that users consider PeerTECH is relevant and easy to handle, especially in self-monitoring and peer-support. However, several problems in user interface and adoption are also taken into consideration. The research concluded that special context modification may increase the usability of the application, making it easier in integrating the application into the community of mental health service in Norway [6].

Based on the previous works, the importance of mental health, the potential of mental health application and the lack of usability test of MoodPath application, this research conducts usability test for MoodPath application. There are two questions tried to get answered in this research, 1) how is the usability of MoodPath application, 2) how to improve the MoodPath application.

RESEARCH METHODS

To evaluate the usability of the MoodPath application, this study employs the Software Usability Measurement Inventory (SUMI). SUMI functions not merely as a questionnaire but as a comprehensive framework for assessing software usability. It encompasses a standardized set of questions, various data collection instruments, and analytical procedures. Developed by Jurek Kirakowski, SUMI has been extensively utilized within the software industry to gauge usability. Although originally part of the Metrics for Usability Standards in Computing (MUSiC) framework, SUMI can be effectively implemented as an independent tool [28].

SUMI itself can be used to assess many types of application such as office tools, computer tools and even accessibility tools. SUMI is compliant with European Directive on Minimum Health and Safety Requirements for Work with Display Screen Equipment (90/270/EEC) and ISO 9241. While SUMI widely used in industry, it is also possible to use SUMI for academic purpose. However, the analysis from SUMI questionnaire remained proprietary (<http://sumi.uxp.ie>).

SUMI questionnaire consists of 50 entries that is used to assess 5 usability scales of a software. Those 5 elements are Efficiency, Affect, Helpfulness, Control and Learnability. Table 1. explains the usability scales.

Table 1. The SUMI Scale

Usability Scale	Info
Efficiency	High efficiency means that users may use the software to complete their work in fast and economically. While low efficiency means that users consider the software as obstruction for their work.
Affect	Affect scale is associated with emotional side of the user. Affect scale shows users feel comfortable or frustrated while working with the software.
Helpfulness	Helpfulness value is high when the users consider that the software gives clear instruction. On the other hand, the value is low when the software fails to communicate itself.
Control	Control scale relates with the respond of the software to user request. The higher the value shows the better the software responding to the user request.
Learnability	Learnability scale is associated with the easiness of learning software. It may be the software itself or the software user guide. It includes the user re-learn process after not using the software for a while.

There is a relation between the entries with the 5 scales. Logically, other than those 5 scales, SUMI also has Global scale to summarize the overall software usability. However, SUMI is unique in such a way that the Global scale isn't a simple average from all other scales but composed from a combination of unique entries. The complete distribution of the entries to all the scales is shown in Table 2.

Table 2. Entries Contribution to SUMI Scale

Usability Scale	Info
Efficiency	1,6,11,16,21,26,31,36,41,46
Affect	2,7,12,17,22,27,32,37,42,47
Helpfulness	3,8,13,18,23,28,33,38,43,48
Control	4,9,14,19,24,29,34,39,44,49
Learnability	5,10,15,20,25,30,35,40,45,50
Global	7, 8, 15, 18, 19, 21, 23, 24, 26, 27, 28, 31, 35, 36, 37, 38, 39, 41, 42, 43, 44, 45, 46, 48, 49

The actual flow of work in this research starts with registration to SUMI and ends with getting the usability value. The complete work is shown in Figure 2.

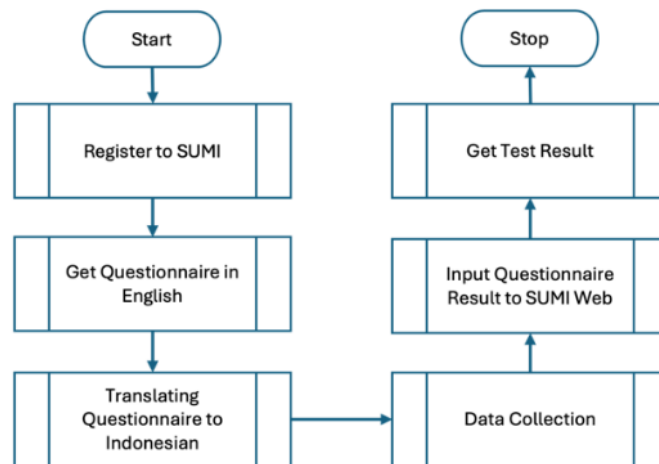


Figure 2. Research Flow of Work

The first stage in the diagram starts with “Register to SUMI” which indicates that the user must first register on the SUMI website. This is an important initial step before being able to access the questionnaire. After registering, the research will proceed to the next stage, which is “Get Questionnaire in English,” which means that the registration process on SUMICO has been successful.

After registering, the research continues with “Getting a Questionnaire in English.” This stage is optional as SUMICO offers several options for filling out and collecting questionnaires. This study chose to get a questionnaire in English. This is related to the research path in the next stages.

The next step in this process is “Translating the Questionnaire into Indonesian.” This translation process ensures that the questionnaire can be used by a wider range of respondents, especially those who speak Indonesian. This is an important step to ensure that the results obtained remain accurate and relevant to the objectives of the study. This was chosen because even though the SUMI questionnaire is available in 14 languages, it does not cover Indonesian. Therefore, this study chose to carry out the translation process itself.

After the questionnaire is translated, the next step is “Data Collection”. This step is done by filling out the questionnaire via online form. The entries are presented in both Indonesian and English. The treatment is chosen to comfort the respondents since some of the respondents feel uneasy with full English entries. However, keeping the authenticity of the entries, the English entries are included.

The next step is “Input Questionnaire Results to SUMI Web.” This stage involves filling out the translated questionnaire into the SUMI system so that it can be used in the next process. Given how SUMI works, this is an option that is considered easiest to facilitate the further analysis process.

The last stage in the diagram is “Get Test Results” which is the final stage before the process is declared complete. Given that SUMI conducts analysis through a proprietary method, direct analysis of the questionnaire entries is carried out by SUMICO. The research make further observation to the initial analysis results from SUMICO.

RESULTS (Bold, 11 pt)

The result of MoodPath usability test is obtained after getting tested by 27 respondents. This number has met the requirements of SUMI. The minimum number of respondents for non-selective

respondents is 20 people, while the minimum number of respondents for selective respondents is 12 people. Respondents in this study are non-selective respondents. The distribution of respondents based on their ability to understand information technology can be seen in Table 3.

Table 3. Distribution of Respondents IT Skill

IT Skill	Count
Very good (has good skills both as user and information technology experts)	3
Good (has good skills as a user)	15
Quite good (able to use software in general)	9
Poor (difficult to use software in general)	0

Respondents' perceptions of the MoodPath software can be seen in Table 4.

Table 4. MoodPath Application Importance Level

Important Level	Count	Percentage
Extremely important	6	22%
Important	21	78%
Not very important	0	0%
Not important at all	0	0%

Overall, the MoodPath app was considered important (78%) and even very important (22%). No respondents considered the app not very important or not important at all. This means that respondents already understand that mental health software in general and MoodPath particularly is important. The summary of the 50 entries in SUMI based on the agreement level is shown at table 5.

Table 5. Summaries of Entries Agreement Level

Agreement	Count
Major agreement	2
Major disagreement	1
Minor agreement	13
Minor disagreement	13
No difference/neutral	21

The analysis from SUMI entries is presented in several ways. The first one is in means as shown in Figure 3.

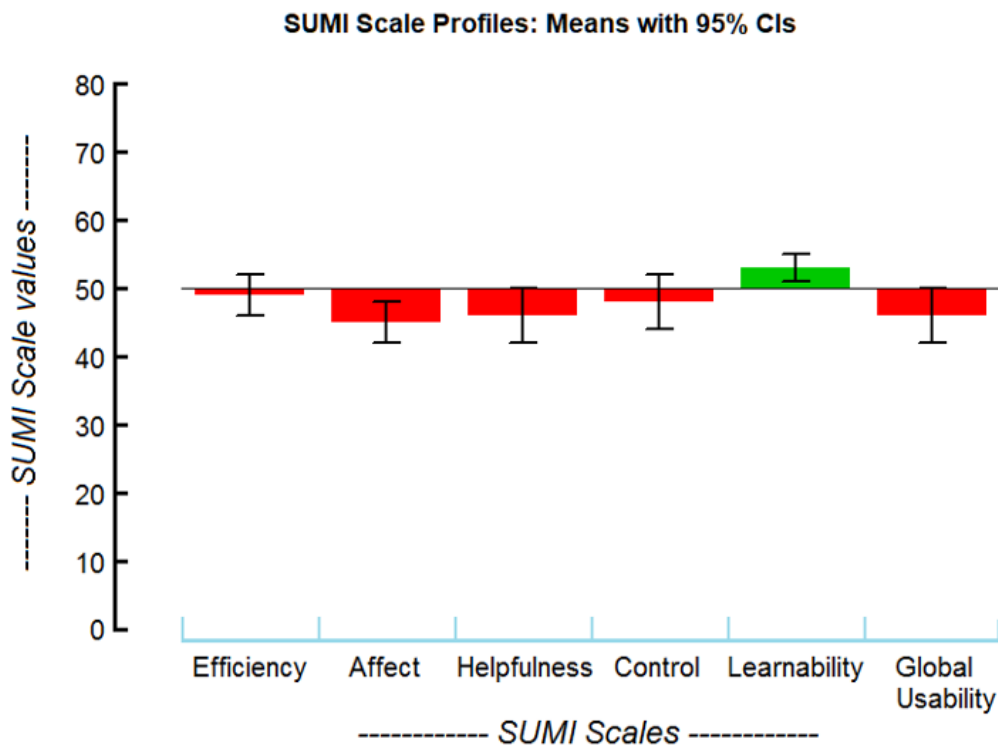


Figure 3. SUMI Mean Value with Confidence Interval

Figure 3. shows the value of every SUMI scale based on the mean of the entries with 95% Confident Interval. For every scale, Efficiency, Affect, Helpfulness, Control and Learnability, the usability scores are 49.26, 45.26, 45.85, 48.07 and 53.07. Based on SUMI guideline, Efficiency, Affect, Helpfulness and Control scales get usability grade C- (below average). Only Learnability scale get usability grade C+ (above average). For Global usability, it also gets usability score of 46.26 (C- / below average). Confident Interval for every mean value show data variability. The result shows that every scale has value that in between the similar range even though Learnability scale has different value.

Figure 4 shows the analysis of SUMI based on mean value and standard deviation. For each scale, the circle shows mean value while the vertical bars show the standard deviation. The dotted line acts as the demarcation line. When the scale value is on the upper part of the dotted line, the scale has good value and vice versa.

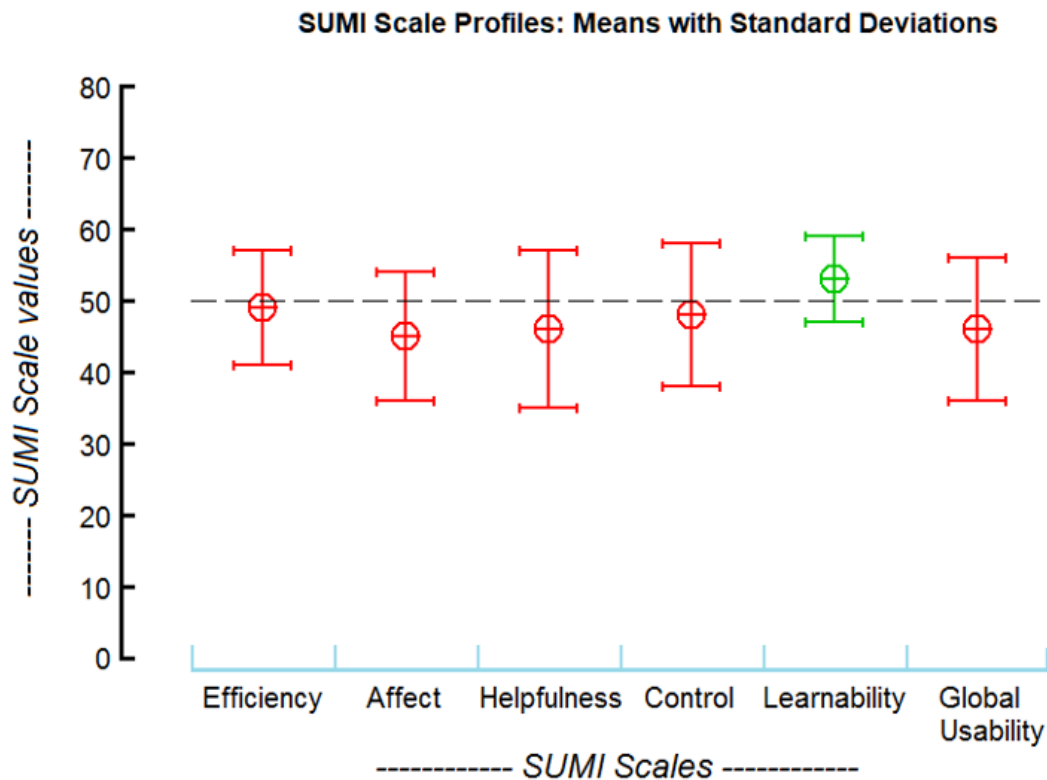


Figure 4. SUMI Mean Value with Standard Deviations

From the chart in Figure 4, the scales mean value are between the 45 and 55. Based on SUMI guideline, the values are in the average category. However, for scales other than Learnability, the deviation is high. It means that the user perception for the MoodPath usability highly varies. Such different perception suggest that the MoodPath has usability that suitable for a group of people and unsuitable for the other group of people. To further analyze the user separation, the mean values are break down based on the user IT skill and shown on Table 6.

Table 6. SUMI Mean Value by IT Skill

IT Skill	E	A	H	C	L	G
Very good (has good skills both as user and information technology experts)	48.7	41.7	42.7	45.3	53.7	43.3
Good (has good skills as a user)	48.3	44.1	45.7	49.6	54.5	45.9
Quite good (able to use software in general)	51.0	48.3	47.1	46.8	50.4	47.8
Poor (difficult to use software in general)						

DISCUSSION

Based on analyzing Figure 3, it is obvious that MoodPath application best scale is Learnability that has above average grade. Meanwhile, the other scales, Efficiency, Affect, Helpfulness and Control, have negative values. With Global usability scale also get below average shows that overall perception of MoodPath usability is considerably not great. The result also

achieved with narrow Confident Interval which means that the result is achieved from relatively consistent data at every sample. Negative values in some scales shows potential in certain areas like user experience (Affect) and system inner help function (Helpfulness). This perspective shows that improvement in the weak scale will improve MoodPath application's overall user experience and usability.

Table 6 shows the mean value for each scale for groups of respondents based on their IT skill. In Global scale that indicate the overall usability of the MoodPath application, the number are different for each group. The Very Good group gave 43.3, the Good group gave 45.9 and the Quite Good gave 47.8. The difference corresponds with the deviation in Figure 3. The phenomenon also happens mostly on scales with big deviation.

From Table 6, Quite Good group gave the best value in 4 scales for the SUMI questionnaire. The Very Good group gave the worst value in 4 scales for the SUMI questionnaire. Based on the observation, further conclusion can be made. MoodPath application is considered have Below Average and even Poor usability by the group of respondents that has the best IT skill while respondents from Poor group consider MoodPath application have Above Average usability. It means that the MoodPath application gives good usability for average user (Quite Good group) but not enough for skilled used (Very Good group).

SUMI also provides free text answer to allow respondent to express their experience without choice limitation. There are two question that have free text answer, i.e. the best aspect of the application and most needed improvement. Top two best aspect of the MoodPath application are the clear UI and the questionnaire itself. MoodPath already implements Google's Material Design that not only give good UI/UX but also familiarity since Material Design is the design language in Android. This is where the Learnability scale gained score. Familiar design makes the MoodPath easy to learn. The questionnaire can be considered good since MoodPath use standard questionnaire that already proven, PHQ-9 and GAD-7. Those questionnaires are concise, straightforward yet has good performance. It helps with the Efficiency scale.

Top two most needed improvement from the respondents are 'Remember Me' and saving questionnaire result. The 'Remember Me' feature is required since users need to re-login every time they run the application. The absence of such feature held the Efficiency scale from getting better score and make the Affect scale got low score. While there are no promise nor indication from the MoodPath application that the questionnaire result can be saved, respondents seem to consider result saving is embedded in the application. Since the MoodPath application didn't provide any features to save the questionnaire result, the research considered that it confused respondents hence lower result in Helpfulness scale.

Combining the free text result with SUMI mean value based on respondent IT skill analysis gave further exploration. In Helpfulness scale, respondents with better IT skill gave low score while respondents with lesser IT skill gave better score. The research saw the link between Helpfulness scale with the result saving feature. This research concluded that respondents with better IT skill required saving result feature while respondent with lesser IT skill didn't find it important. Creating such application turns out need to consider larger audience and not only people with lesser IT skill.

From the qualitative answer, such example can be drawn. The MoodPath application gives standard registration and login for user. This feature may be considered enough for average users (Quite Good group) however skilled users (Very Good group) may demand more. That demand is that login state preservation in such way that users don't need to re-login every time run the application.

CONCLUSIONS AND RECOMMENDATIONS

The research tries to find the usability of MoodPath application. The usability test used Software Usability Measurement Inventory (SUMI) questionnaire from 27 respondents. MoodPath application got usability value of 46.26 that is Below Average in Global SUMI scales. The value is also related with every individual scale in SUMI. The Efficient, Affect, Helpfulness and Control scales have the following value 49.26, 45.26, 45.85 and 48.07, all of which Below Average. Only the Learnability scale has 53.07 value that Above Average. The usability result is reached with 95% Confidence Interval. Based on the IT skill, respondents with better IT skill gave lower usability score compared to respondent with lesser IT skill. The research also found that familiar UI and standard questionnaire (PHQ-9 and GAD-7) gave positive usability in Learnability and Efficiency scale.

The research found that MoodPath application need to consider wider range of users by giving feature that not only satisfied people with lesser IT skill but also people with better IT skill. Based on the usability test, the MoodPath application may improve the usability by providing 'Remember Me' and result saving features. The result saving feature is considered required by people with better IT skill.

Further work can be made by conducting usability test with specific tool such as mHealth Application User Questionnaire (MAUQ) to give a more specific usability result compared to general usability with SUMI.

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