

## USABILITY STUDY OF A WEB-BASED RESEARCH TOOL FOR OCCUPATIONAL THERAPY ADAPTATION ACTIVITIES: A CASE STUDY AMONG UNIVERSITI TEKNOLOGI MARA, PUNCAK ALAM CAMPUS STUDENTS

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### ABSTRACT

*The function-led innovation kit (FLIK) is a web-based research tool (WBRT) that is developed as a platform for interdisciplinary research between design and occupational therapy to assist occupational therapists with their adaptation activities. The current study evaluated the usability of FLIK to gain appropriate recommendations before it is used in real-life experiments. The usability test, a common test to check most computer-based software or phone applications, was administered to gain insights into user interactions with a product to predict their overall experience. The WBRT was run online in a group session with related procedures. Finally, an evaluation question was distributed and the feedback from the participants included Nielsen's Attributes of Usability Questionnaire (NAU) adapted to the five Likert scale for five participants. The responses were analysed based on NAU attributes to usability: learning, efficiency, memorisation, errors, and satisfaction. The results showed the participants were satisfied with the system but a few improvements suiting the participant's recommendation were needed. Conclusively, a usability test is a significant method to improve ease of use during the development of a system and to assess user behaviour and experience of a system. Further studies of the UI/UX implementation on the WBRT shall add value to the quantitative usability elements.*

## 1. INTRODUCTION

The Internet and computer-based communication have become integral components of modern life. Their use is not restricted to general purposes but also encompasses specific purposes, for example in education. Educational researchers have been utilising

online platforms to produce valid and reliable research as they offer access to unique participants and minimise time constraints and efforts (Kevin, 2005). Other than being used as a search engine, online platforms benefit data collection and management through the

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availability of familiar research methods namely surveys, interviews, focus group discussions and social network analysis (QuestionPro).

Currently, the web-based research tool (WBRT) is getting its place among researchers around the world. A web-based design called 'Function-led Innovation Kit' (FLIK) is a research tool for the survey data collection on the adaptation activities of occupational therapy that is directed by the concept of user-centred design (UCD) to ease the designed task. FLIK, which is based on the design thinking process stages of empathy, define, develop, test, and deliver, and adapted to the experience-led relationship model of Fenn and Hobbs (2017) (Yusof et al., 2020), adheres to the client-based approach as therapists are to avoid jargon practice during their activities. In short, FLIK is a solution proposed by the researcher to assist expert users (occupational therapists) without formal design knowledge to adapt or innovate, enabling them to understand how to adapt a design process like a designer.

Typically, the assistance of the design process happens face-to-face. However, there has been a need to convert the process into a computer system that suits the working setting of occupational therapists who have tight schedules. Moreover, the success of the mobile or health technology (mHealth) application, which converted face-to-face system to an online system, has been highlighted in many studies as a reliable system for patient self-assessment and management (Wildenbos et al., 2015; ). This provides inspiration for the use of FLIK for occupational therapists which was rarely focused on in previous research. Thus, the use of FLIK must be tested.

The current research aimed to highlight the importance of design strategy on occupational therapists as non-design experts in enhancing their understanding of design practice in order to promote better assistance to patients during their rehabilitation sessions.

## 1.2 Literature Review

'Research tools' is a terminology that has a dynamic use in research whereby it appears in various forms to support researchers in conducting research activities such as data collection, data organisation, data analysis, and data visualisation). However, some studies base their definition of 'research tools' on the methodology used during data collection, which can be either qualitative or quantitative approaches. Despite the differing definitions, research tools have specific characteristics. For instance, research tools act as resources that provide an overview or in-depth information on a topic.

Previously, the examples of research tools were limited to physical resources such as books and journal articles. Then, computer-based communication begins to flourish. The Internet starts providing thousands of references through its open sources, search engines, and

websites (College, 2015). Emails are used as a research tool during the data collection process. Studies have revealed that emails are a powerful tool to reach boundless participants nationwide, enabling electronic surveys, interviews, and focus groups to be conducted (Neil Selwyn and Kate Robson, 2013). Despite emails requiring less money and taking less time, using emails as a research tool offers significant results. Later, the development of electronic research tools widened into web-based strategies and mobile applications, called web-based research tools (WBRT). The tool is referred to as a system, developed for research to achieve certain results for target participants. Research tools, by then, are mostly engaged with user experience (UX) and user interface (UI). According to Albrecht et. al (2009), several considerations on methodological issues such as follow-up sessions with the participants, fast feedback, recruitment of subjects, and generalisation of data shall be made in WBRT. From the considerations, one of the three types of WBRT could be chosen: web-hosted survey wizard, web survey wizard, or custom design.

An example of WBRT is Simple Modular Architecture Research Tool (SMART). SMART, a simple module that identifies construction works and predicts future estimates, is used by architects that allow rapid identification and annotation of signalling domain sequences (Onting, 1998). Another example of WBRT in the engineering field is ASCENTW which minimises the complicated process of a procedure and supports user understanding at the appropriate level (Lockyer et al., 2003). WBRT is also used in the medical and health science field as an intervention for clients' individual assessment. Clients also receive web-and-mobile-based education to improve self-care, patient-clinician communication, and access to health information). To date, WBRT can ease research activities. However, in the future, WBRT can promote the practice of new systems in the related field.

## 2. METHODOLOGY

Usability testing is a method to get feedback from users on their experience using an application or system developed for certain usage. The method is common in testing mobile applications where users are given tasks within the appropriate environment of their field or background to minimise the severity of any problems that may occur during laboratory testing or field testing ). It is relevant to evaluate medical and healthcare informatics applications in order to minimise operational errors). Bastien (2018) adds that usability testing is a user-based evaluation with user behaviours recorded to recognise difficulties and gestures. Nielsen (1994) suggests six usability categories be considered during a usability test: learning, efficiency, memorability, error, user satisfaction and open questions. The attributes are later implemented in the reflection survey of the participants.

|   | Attributes     | Description   |
|---|----------------|---|
| 1 | Learning       | This system is simple to use. The information provided with this system is easy to understand.  |
| 2 | Efficiency     | I easily found the information I am looking for. I was able to quickly complete my task with this system.   |
| 3 | Memorability   | The organisation of information in the system screens is clear. The system is easy to remember.   |
| 4 | Error          | The error messages presented by this system tells me clearly how to solve problems. When I made a mistake using this system, it was easy and quick to correct it. |
| 5 | Satisfaction   | The interface of this system is nice. This system has all the functions and potentially corresponds to my expectations.   |
| 6 | Open questions | In your opinion, what are the items, information or services missing from the system? What are the possible improvement points?                                   |

Table 1: Nielsen's attributes of Usability Questionnaire (NAU)

Participants

A total of five student occupational therapists were selected to participate in the current study. According to Virzi (1992), Nielsen (1993) and Lewis (1994), the number is sufficient to uncover 80 to 85 per cent of interface problems. In previous studies, problems were discovered by the first three to five participants. As a result, Nielsen Norman Group concludes that upon data from a single user, a study could yield insights into almost a third of the design usability as users tend to replicate the actions of the first user.

Research Tool

In general, the function-led innovation kit (FLIK) assists occupational therapists in organising the flow of adaptation activities for their clients based on design principles. It structures the process into four design phases: empathy, define, develop, and deliver. Throughout the phases, users could identify and determine the needs of their clients through the use of the designed questions. Finally, a conclusion is made on the type of solution for the clients.

FLIK is categorised as a web-hosted survey wizard of WBRT as it is housed on a remote web server which is outside of the researcher's association. It has its domain (demo.expad.net) and is primarily used for market research or data collection. Users are subjected to annual payments for website maintenance and to maintain authority on the website. The current study employed FLIK to conduct usability testing. FLIK was administered in such a way that was not accessible to those without the provision of a unique identifier, as depicted in Figure 1.

The test procedures

In the current study, the session between the participants and the researchers was conducted online because the study was conducted during the Movement Control Order (MCO) due to the COVID-19 pandemic. Therefore, participants were advised to use their personal laptops or computers.

Several procedures were structured to run the usability testing within one to two hours. The researcher started the session with a briefing on the overall objectives of the testing and surveys, along with the outcomes of the session. The participant then administered the test. They were free to explore FLIK based on their client's case until the completion of all four stages of FLIK (refer to Figure 3).

The first stage of FLIK required participants to fill in the personal details and profile of one of their clients for treatment or assessment purposes. In the second stage, the participants entered details of all four design stages: empathy (S1), define (S2), develop (S3), and deliver (S4). FLIK provided specific instructors for each stage and required participants to submit their responses in three distinct formats, namely: (i) drop-down menu, (ii) sketches and reference images upload, and (iii) fill-in-the-blanks. In the third stage, responses were directed to the intended product for their client. In the final stage, participants gave their feedback on a post-evaluation form, conforming to any issues arising during their experience using FLIK. The findings estimated the effectiveness of the characteristics of FLIK and its interface for future use.



Figure 1: FLIK's login

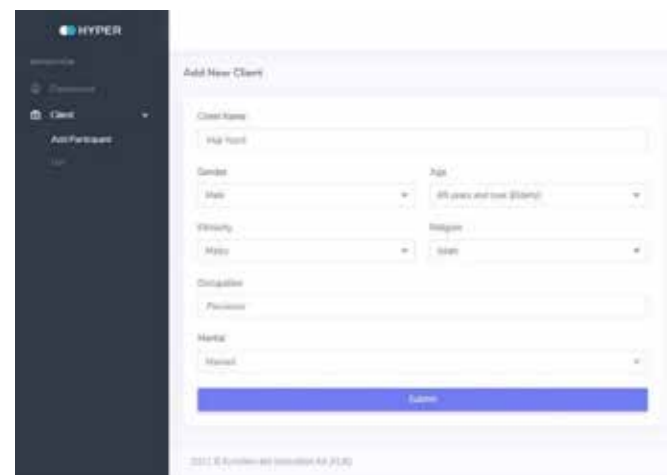


Figure 2: Client's profile



Figure 3: FLIK's stages

| Stage of FLIK      | Task   | Type of answer  |
|--------------------|--|---|
| 1 Empathy          | Stage 1: Empathy requires understanding client's personal traits and helps therapists to understand client's background, environment and lifestyle to feed their needs better. You will be asked to record basic details of the client's: i) Profile, ii) Personality, iii) Routine Overall, this stage serves to understand the context of subject. Suggestion time: 20 % of your session time.   | Drop-down menu  |
| 2 Define           | Stage 2: Define used User-centered design (UCD) approach to define specific solution for the client. It is a framework of processes in which usability goals, user characteristics, environment, tasks and workflow of a product, service or process are given extensive attention at each stage of the design process. You will be asked to record basic details of the client's case to define the design solution and needs in the next stage. Overall, this stage serves to identify and justify the requirement of subject. Suggestion time: 20 % of your session time. | Drop-down menu  |
| 3 Develop and test | Stage 3: Develop and test requires most of the stages time. Ideas of design are generated through research and copy. This stage also requires your previous life or working experiences to enhance the design. You will be asked to record basic ideation details of the :<br>i) Existing product<br>ii) Technology<br>iii) Material<br>iv) Construction<br>v) Suggested testing<br>Overall, this stage serves to develop solutions to subject. Suggestion time: 50 % of your session time.  | i) Sketches and reference images<br>ii) Open-ended answer |

| Stage of FLIK | Task  | Type of answer |
|---------------|---|----------------|
| 4 Deliver     | Stage 4 : This stage requires implementation and evaluation activities towards the intended design solution which involves; phasing, final testing and evaluation. Feedback is gathered for future improvements. Overall, this stage serves to evaluate the design solution of the subject. Suggestion time: 10 % of your session time. | Drop-down menu |

Table 2: FLIK's task

### 3. RESULT

All five participants were able to finish the stages within the time given. In the current study, the results were reported based on the participants' knowledge and personal practice of the process of adaptation design activities in the context of occupational therapy for patient assessment and exercise. The results are arranged according to the percentage of preferred ranking (refer to Table 3). The perceptions of FLIK on the system's command and interfaces among the participants were also recorded for future use of FLIK.

| Question  | Rank % (n)             |               |              |            |                     |
|---|------------------------|---------------|--------------|------------|---------------------|
|   | 1<br>Strongly disagree | 2<br>Disagree | 3<br>Neutral | 4<br>Agree | 5<br>Strongly agree |
| 1. Overall, I am satisfied with how easy it is to use this system   |                        |               |              | 80 % (4)   | 20 % (1)            |
| 2. It was simple to use this system.  |                        |               | 40 % (2)     | 40 % (2)   | 20 % (1)            |
| 3. I was able to complete the tasks and scenarios quickly using this system.  |                        |               | 40 % (2)     | 40 % (2)   | 20 % (1)            |
| 4. I felt comfortable using this system.  |                        |               |              | 80 % (4)   | 40 % (1)            |
| 5. It was easy to learn to use this system.   |                        |               |              | 60 % (3)   | 40 % (2)            |
| 6. I believe I could become productive quickly using this system.   |                        |               | 20 % (1)     | 60 % (3)   | 20 % (1)            |
| 7. The system gave error messages that clearly told me how to fix problems.   |                        | 40 % (2)      |              | 40 % (2)   | 20 % (1)            |
| 8. Whenever I made a mistake using the system, I could recover easily and quickly.  |                        |               | 20 % (1)     | 80 % (4)   |                     |
| 9. The information (such as online help, on-screen messages and other documentation) provided with this system was clear. |                        |               | 40 % (2)     | 40 % (2)   | 20 % (1)            |
| 10. It was easy to find the information I needed.   |                        |               |              | 100 % (5)  |                     |

| Question  | Rank % (n)                |               |              |            |                        |
|---|---------------------------|---------------|--------------|------------|------------------------|
|   | 1<br>Strongly<br>disagree | 2<br>Disagree | 3<br>Neutral | 4<br>Agree | 5<br>Strongly<br>agree |
| 11. The information was effective in helping me complete the tasks and scenarios. |                           |               | 40 % (2)     | 40 % (2)   | 20 % (1)               |
| 12. The organisation of information on the system screens was clear.              |                           |               | 20 % (1)     | 80 % (4)   |                        |
| 13. The interface of this system was pleasant.                                    |                           |               |              | 100 % (5)  |                        |
| 14. I liked using the interface of this system.                                   |                           |               |              | 100 % (5)  |                        |
| 15. This system has all the functions and capabilities I expect it to have.       |                           |               | 60 % (3)     | 40 % (2)   |                        |
| 16. Overall, I am satisfied with this system.                                     |                           |               |              | 80 % (4)   | 20 % (1)               |

**Table 3:** Post evaluation result for FLIK

## ANALYSIS

All participants completed the tasks successfully. The results of each NAU attribute were discussed as learning, efficiency, memorability, error, and satisfaction usability define usability. Given that the current study employed a qualitative usability test, the analysis only focuses on user understanding, experience, and behaviour towards the web-based system.

- i) Learning: How easy is it for users to accomplish basic tasks the first time they encounter the design?

Even though FLIK is a newly developed system, participants showed positive learning reactions to the system and they endorsed web-based learning. Participants had to individually complete the design task after an explanation was made by the researcher. This demonstrates their understanding of the system's terminology and the instruction of the design process on FLIK with a lack of assistance.

- ii) Efficiency: Once users have learned the design, how quickly can they perform tasks?

The efficiency of the system was experienced with 20 per cent hesitation. This was due to the participant's preference for a manual adaptation process as it may take time for users to adapt to a new system.

- iii) Memorability: When users return to the design after a period of not using it, how easily can they re-establish proficiency?

FLIK is designed as a phases platform which allows users to navigate the platform with its simple process and familiar commands. In the current study, a total of 60 per cent of the participants agreed and 40 per cent strongly agreed that the task instructions in FLIK were easy to understand. Therefore, it is concluded that the memorability of

working with the system is made easy to use.

- iv) Error: How many errors do users make, how severe are these errors, and how easily can they recover from the errors?

As a newly developed web-based system, minor errors were detected. However, it was considered normal for first-time users. The participants agreed that the error notification from the system command helped them to complete the task, which earned the system 20 per cent neutrality on the system's recovery function.

- v) Satisfaction: How pleasant is it to use the design?

Overall, the participants were satisfied with FLIK. FLIK comes with a pleasant user interface, a stage-by-stage process, and understandable terminology. Nevertheless, some revisions are needed to support the adaptation practice of occupational therapists. There is also a need to add a continuity function (save) to avoid missing data as the adaptation process might take a longer time for some clients' cases. This function also helps other colleagues if they need to continue the assessment. Although 60 per cent of the participants selected 'neutral' which describes the uncertainty of the system, it is justified because the system is new and still under supervision. In contrast, the usage and implementation of the system suit the purpose of usability testing, which is to identify performance.

## 4. CONCLUSION

Based on the findings of the current study, it is concluded that a usability test can be used as an indicator to identify user behaviours and emotions when experiencing FLIK. Following Nielsen attributes allows for the exploration of the insights of a system through its five considerate elements. A usability test is significantly a method that can improve ease of use during the development of a system. It is important for a research tool to be tested before launching as people will abandon a system that is difficult to handle as the usefulness of a system comes together with usability and utility. Positive feedback from FLIK users during the first trial proves the ability of the system to enhance the capability of occupational therapy practitioners and even other rehabilitation staff in the adaptation design process. Hence, besides that FLIK implements efficient documentation for an adaptation process, collaboration as a result of using FLIK also expedites working processes (Amiri et al., 2017).

The current study also portrays a potential research tool that can be applied in the related field practice which can promote design expertise in a new way ). Also, further studies on the design of the UI/UX of a system or application as part of the usability research are recommended.

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