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# Evaluating Usability of Artificial Intelligence (AI) Based M-Health Applications Through Cognitive Walkthrough

PRESENTED BY DR. MAJED ALSHAMARI

[SMAJED@KFU.EDU.SA](mailto:SMAJED@KFU.EDU.SA)

# content

- ▶ Introduction
- ▶ Background
- ▶ Research problem
- ▶ Methodology used
- ▶ Data Analysis
- ▶ Further work
- ▶ Conclusion

# Introduction



- ▶ Artificial Intelligence (AI) technology has been adopted and employed in healthcare section to develop applications for providing various healthcare services.
- ▶ The effectiveness of these apps depends on their usability, which is a critical factor in their success.
- ▶ One approach to evaluating the usability of these apps is through a cognitive walkthrough

# Background (1-2)



- ▶ Nowadays, everyone irrespective of their age can access smart devices including smart televisions, tablets, phones, and other internet-connected devices because of digital media.
- ▶ In the past decade, the health industry has seen phenomenal growth and pushed healthcare delivery to new levels. Therefore, m-health is becoming an essential sector for delivering and spreading health in our society as a whole.

# Background (2-2)

- ▶ The mobile health (mHealth) app market is anticipated to develop at a compound annual growth rate of 17.7% throughout the forecast period.
- ▶ According to research, up to 34% of smartphone owners have at least one health app loaded on their mobile devices
- ▶ Also, the usage of artificial intelligence (AI) in mobile apps for healthcare systems, finance, and entertainment has increased primarily due to smartphones and tablets

# Research problem (1-3)

- ▶ Using AI-based applications in healthcare is of particular importance to patients; therefore, it is important that their use does not harm them, but rather benefits them. Thus, AI systems should provide patient satisfaction across multiple healthcare environments and be effective and efficient.
- ▶ There are nearly 165,000 mobile health (mHealth) apps available in the Apple iTunes and Android app stores in the United States.

# Research problem (2-3)

- ▶ Many mHealth apps have designed with little input from end users, and they continue to expand despite limited evidence of user engagement.
- ▶ A depression-screening model has been evaluated by N. Fasihah Jamaludin to examine how effective it was at addressing adolescent motivation during gamification-based depression screening, through a cognitive walkthrough

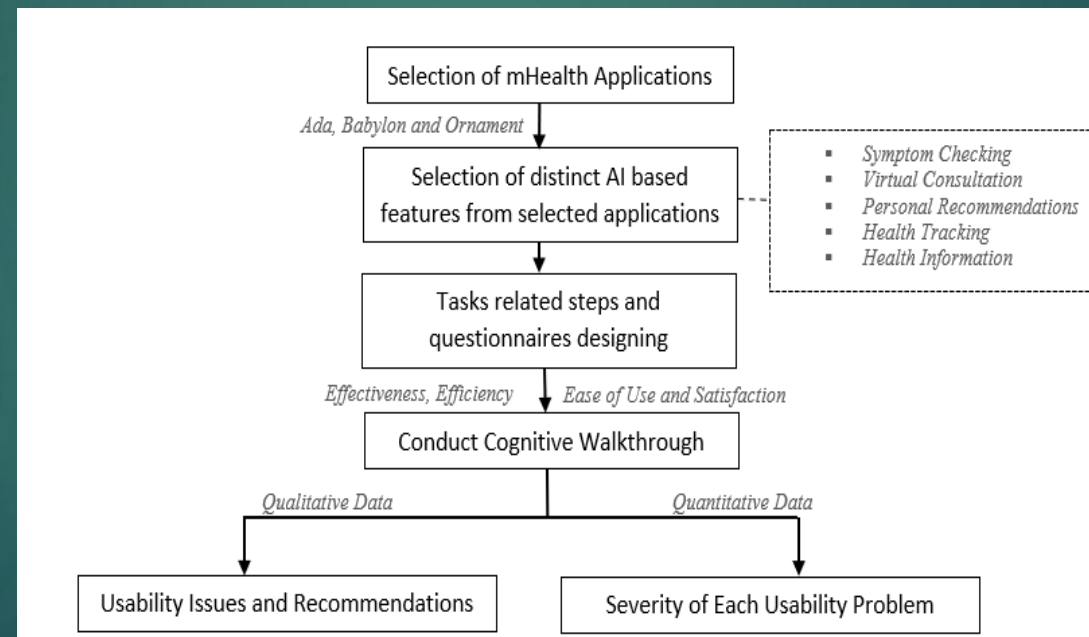
# Research problem (3-3)

- ▶ A. S. Dahri investigates how well the mobile health application “mHealth” is used by patients by accessing their satisfaction with their tasks.
- ▶ M. N. Islam et al developed a mobile-based solution “Muktomon” which means open one’s mind, for providing mental health support to the people of Bangladesh. This application provides virtual therapy through videos and audio, a chatbot service for mental health assistance
- ▶ The cognitive evaluation method has been used to evaluate the usability of a user interface of a Nursing Information System (NIS)



# Methodology used (1-2)

- ▶ The proposed work evaluates the effectiveness, efficiency, ease of use and satisfaction of 3 AI applications (Ada, Babylon and Ornament) in healthcare using cognitive walkthroughs.
- ▶ The work framework is follows:



Complete Workflow Diagram of conducting CW to Evaluate usability 3 Applications

# Methodology used (2-2)



**Figure 2. Ada Health Mobile App Home Screen**



**Figure 3. Babylon Health Mobile App Home Screen**



**Figure 4. Ornament Health Mobile App Home Screen**

\* For a cognitive walkthrough evaluation, a minimum of three evaluators is recommended to ensure that a variety of perspectives are represented

# Data Analysis (1-3)

| AVERAGE SEVERITY OF IDENTIFIED PROBLEMS AND AVERAGE TIME TAKEN BY EACH TASK |                 |                     |                      |                                 |                                     |                                      |
|---|-----------------|---------------------|----------------------|---------------------------------|-------------------------------------|--------------------------------------|
| Tasks   | Severity in ADA | Severity in Babylon | Severity in Ornament | Average Time Taken in Ada (min) | Average Time Taken in Babylon (min) | Average Time Taken in Ornament (min) |
| Symptom Checking  | 25              | 20                  | 0                    | 03:35                           | 02: 58                              | 00:00                                |
| Virtual Consultation  | 0               | 8                   | 0                    | 00:00                           | 00:00                               | 00:00                                |
| Personal Recommendations  | 6               | 3                   | 6                    | 03:50                           | 04: 38                              | 05:34                                |
| Health Tracking   | 0               | 4                   | 10                   | 00:00                           | 02:10                               | 04:23                                |
| Health Information  | 6               | 5                   | 5                    | 02: 35                          | 01:25                               | 03:59                                |
| Average   | 7.4             | 8.0                 | 4.2                  | 03:20                           | 02:48                               | 04:39                                |

AVERAGE SEVERITY OF IDENTIFIED PROBLEMS AND AVERAGE TIME TAKEN BY EACH TASK

# Data Analysis (2-3)

| Usability Attributes | Application | Identified Problem   | Recommendations  | Task                     |
|----------------------|-------------|--|--|--------------------------|
| Effectiveness        | Ada         | AI model only enlist few possible diseases and nothing else. | Provide with medical treatment options as well.  | Symptom Checking         |
|                      | Babylon     | No personal recommendation according to expectation          | Retrain the model with updated data and new algorithms Or use collaborative filtering techniques | Personal Recommendations |
|                      | Ornament    | limited options (disease) were given on "Ask Doctor page"    | Add more variety of diseases to choose from  | Health Tracking          |

AN EXAMPLE OF USABILITY ATTRIBUTE-BASED IDENTIFIED PROBLEMS AND RECOMMENDATIONS

# Data Analysis (3-3)

- ▶ One of the problems that evaluators reported frequently is inaccurate and unexpected results of symptom checker model of applications and it is related to effectiveness of AI models and applications. Other research studies have found that health applications often suffer from poor accuracy, which can undermine their effectiveness.
- ▶ Another reoccurring problem that evaluators reported is no search bar when performing health information task, thus, affecting the efficiency usability attribute. Usability issues related to efficiency have also been identified in the literature reported frustration in users due to long waits.

# Further work

- ▶ it is clear that evaluating the usability during the development and design of mHealth applications, especially those that use AI-based features is crucial to ensure the success and effectiveness of application.
- ▶ Adding more usability evaluation methods can enrich such studies taking into account also additional mobile applications. Involving larger number of users can be seen as an extension of this research project.

# Conclusion

- ▶ The widespread use of mobile healthcare application with making use of artificial intelligence technology provide numerous healthcare services to their users.
- ▶ The number of mobile applications in increasing day by day, evaluating their usability in terms of effectiveness of AI systems they provide, efficiency in terms of time user take to perform a task, ease of using application and over experience of user is crucial factor in their success.
- ▶ Cognitive walkthrough is one of many methods of usability evaluation. In this study, we selected 3 applications that make use of AI in their features, on the basis of their popularity, and availability to evaluate their usability through cognitive walkthrough.



*Any questions*  
*Thank you for listening*