

A CRITICAL EVALUATION OF POPULAR UX FRAMEWORKS RELEVANT TO E-HEALTH APPS

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ABSTRACT

This research paper aims to evaluate the usability, accessibility, and effectiveness of the current User Experience (UX) frameworks relevant to mobile health apps, with a specific focus on the FitBit app. The selected UX frameworks for evaluation include Nielsen Norman Group's 10 Usability Heuristics, Don Norman's Three Levels of Design, and Human-Centered Design. A mixed-method approach, comprising both qualitative and quantitative analyses, was employed to evaluate these frameworks. The FitBit app was assessed based on the selected frameworks, and the obtained results were compared with existing literature and industry standards. The main subject of this study is the critical evaluation of popular UX frameworks in the context of e-health apps, with a specific emphasis on the FitBit app. The evaluation factors considered include usability, accessibility, and effectiveness. By utilizing the selected UX frameworks, the paper seeks to identify the strengths and limitations of each framework in evaluating e-health apps. The achieved results reveal that Nielsen Norman Group's 10 Usability Heuristics are valuable in identifying usability issues within the FitBit app. Don Norman's Three Levels of Design effectively evaluate the overall user experience, providing insights into the app's design quality. Human-Centered Design, on the other hand, offers a comprehensive and holistic approach to designing for the user, encompassing various aspects of the FitBit app. Through this research, a comprehensive understanding of the strengths and limitations of the evaluated UX frameworks in relation to e-health apps, specifically the FitBit app, is attained. The findings contribute to the existing literature on UX evaluation and provide insights for designers and developers to enhance the user experience of mobile health applications.

KEYWORDS

UX frameworks, e-health apps, FitBit app, Nielsen Norman Group's 10 Usability Heuristics, Don Norman's Three Levels of Design, Human-Centered Design, usability, accessibility, effectiveness.

1. INTRODUCTION

In recent years, the widespread adoption of e-health apps and wearable devices has revolutionized the way individuals track and manage their health. These apps aim to promote healthy behaviours by enabling users to monitor their physical activity, food intake, and other health-related data conveniently. Among the various wearable devices available, FitBit has emerged as a popular choice among fitness enthusiasts worldwide. However, the success of these e-health apps relies heavily on the user experience (UX) they provide. A satisfying and engaging UX is crucial for retaining users and ensuring the long-term success of these apps. Therefore, it is essential to critically evaluate the popular UX frameworks employed in the development of e-health apps like FitBit.

The motivation behind this study stems from the increasing importance of UX in the success of e-health apps. While there have been significant advancements in e-health technology, there remain challenges in creating seamless and user-friendly interfaces that cater to the diverse needs and preferences of users. Users expect e-health apps to be intuitive, engaging, and accessible, while also delivering accurate and meaningful health-related information. Addressing these challenges and creating a superior UX is paramount for user retention, user satisfaction, and ultimately improving individuals' health outcomes.

The objectives of this research paper are as follows:

1. To critically evaluate the effectiveness of popular UX frameworks used in the development of e-health apps, with a specific focus on the FitBit app.
2. To assess the usability, engagement, accessibility, and aesthetics of the FitBit app based on the selected UX frameworks.
3. To identify strengths and limitations of the evaluated UX frameworks in the context of e-health apps and provide recommendations for their improvement.

To achieve these objectives, we will conduct a comprehensive evaluation of popular UX frameworks, including Nielsen Norman Group's 10 Usability Heuristics, Don Norman's Three Levels of Design, and Human-Centered Design. These frameworks are widely recognized and employed in the design and evaluation of user interfaces. Through a mixed-method approach, combining qualitative and quantitative analyses, we will assess the FitBit app based on these frameworks and compare the results with existing literature and industry standards.

In the critical evaluation, we will focus on key factors such as usability, engagement, accessibility, and aesthetics. Usability, in particular, plays a fundamental role in determining the success of any app. Research has shown that usable interfaces contribute to higher user satisfaction, increased engagement, and improved task performance. For instance, a study by Balaam et al. [1] demonstrated that designing interactive systems with a focus on usability leads to more efficient energy management in the home environment. Similarly, in the context of e-health apps, studies have emphasized the significance of usability in improving user experience and facilitating health behaviour change. By evaluating the FitBit app, we aim to identify its strengths and weaknesses in terms of usability, engagement, accessibility, and aesthetics. These aspects are crucial for delivering a compelling user experience and sustaining user engagement. By leveraging the selected UX frameworks, we will provide insights into how well the FitBit app aligns with established principles and guidelines. This research will help inform designers, developers, and researchers in enhancing the UX of e-health apps, ultimately leading to better user engagement, improved health outcomes, and increased user satisfaction.

2. LITERATURE REVIEW

2.1. Nielsen's 10 Usability Heuristics

This research paper [2] focused on proposing the use of usability heuristics as a parameter for assessing usability testing. The author argues that usability is an essential aspect of software development, and usability testing is a vital step in ensuring that software is user-friendly and meets the user's needs.

The paper provides an overview of the concept of usability and usability testing and the importance of heuristics in evaluating usability. The author discusses the ten usability heuristics

proposed by Jakob Nielsen and how they can be used to assess usability during testing. The author also presents a case study to demonstrate the effectiveness of usability heuristics in evaluating the usability of a software application.

The paper is well-written and presents a convincing argument for the use of usability heuristics in assessing usability testing. The author provides a thorough explanation of the heuristics and how they can be used to evaluate software usability, making the paper a useful resource for software developers and usability testers. Overall, the paper provides valuable insights into the importance of usability testing and the role of usability heuristics in evaluating software usability.

The paper [3] provides an overview of the importance of usability in e-learning applications, particularly for children, and emphasizes the need for usability evaluation using heuristics. The authors propose a set of usability heuristics specifically tailored for child e-learning applications based on previous research and expert opinions.

The authors conducted a study to evaluate the usability of two e-learning applications for children using the proposed heuristics. The study involved 30 children between the ages of 5 and 7, and the results showed that the proposed heuristics were effective in identifying usability issues in the applications.

Overall, the paper provides a valuable contribution to the field of e-learning by proposing a set of usability heuristics specifically designed for child e-learning applications and demonstrating their effectiveness in evaluating the usability of e-learning applications for children. The study conducted by the authors provides valuable insights into the importance of usability evaluation and the role of usability heuristics in identifying usability issues in e-learning applications.

2.2. Don Norman's Three Levels of Design

Don Norman proposed [4] the theory that good design depends on three key factors: discoverability (ability to figure out how something works), understandability (ability to realize why it works that way), and usability (ability to use it effectively and efficiently).

In the research paper [5], the authors apply this framework to the design of smartwatches. They argue that the success of smartwatches depends on how well they are designed at each of these three levels. At the visceral level, smartwatches need to be visually appealing and aesthetically pleasing. The authors argue that this is particularly important for smartwatches, which are often worn as fashion accessories. Smartwatches need to look good on the wearer's wrist and match their personal style. At the behavioural level, smartwatches need to be easy to use and intuitive. The authors argue that smartwatches need to be designed with the user in mind, and that they should be simple and straightforward to use. This means that smartwatches need to have a clear and easy-to-use interface that is responsive and intuitive. At the reflective level, smartwatches need to have meaning and emotional appeal. The authors argue that smartwatches need to be designed to create a connection with the wearer, and that they should be designed to elicit positive emotions and feelings of satisfaction.

The paper [6] introduces Norman's Three Levels of Design, which includes visceral, behavioural, and reflective levels. The authors argue that these levels play a significant role in the emotional experience of users and the success of a design. They propose that designers should consider all three levels in their design process to create emotional resonance and a positive user experience.

In the paper [7], The authors apply Norman's Three Levels of Design to analyse the design process of a cultural artifact, a Malaysian kite. They argue that the visceral, behavioural, and reflective levels can provide a useful framework for analysing cultural artifacts and understanding

their emotional resonance with users. By applying this framework, they were able to identify areas for improvement and create a more effective design.

2.3. Human-Centered Design

In the research paper [8], Communication systems created for business, research, and sometimes even entertainment can all benefit from the author's considerations regarding human-centered system design. The majority of the sections, in fact, leave one eager to test their favourite or ongoing designs against the numerous recommendations and analysis of the choices they lay out. This research paper offers a valuable new resource for instructors and facilitators of industrial conferences.

A preliminary literature assessment and views on the creation of human and user-centered design products have been studied in the investigation offered in this paper [9]. Author have provided a thorough explanation of the HCD methodology, which they view as a practical and reliable strategy for creating interactive connected health devices. Technique gives HCD and development a quick, efficient framework that will work for current design and usability engineering teams in highly competitive, time-constrained markets. The actions that can be taken throughout each phase have been thoroughly covered. Author also explained why we think this technique is adaptable and valuable, especially for enhancing the usability, human aspects, and user experience of systems and gadgets intended for use in the medical field.

2. METHODOLOGY

The aim of this research was to evaluate the user experience of the Fitbit application using three selected user experience (UX) frameworks. The three frameworks selected were Nielsen Norman Group's 10 Usability Heuristics, Don Norman's Three Levels of Design, and Human-Centered Design. The research process included a background study, a literature review, a survey questionnaire, data analysis, and user testing. The research findings provided insights into the usability, accessibility, and effectiveness of the selected UX frameworks.

The first step in the research process was to conduct a background study to identify an appropriate application for evaluation. Fitbit was chosen as the application due to its popularity among users and its widespread use in the fitness and health industry.

A literature review was conducted to identify relevant UX frameworks to evaluate the Fitbit application. The three selected frameworks were chosen based on their widespread use and recognition in the field of user experience design. The literature review involved referring to reputable researchers' works and research papers.

A survey questionnaire was developed based on the selected UX frameworks and distributed to a selective group of 57 participants who had experience using the Fitbit application. The survey questions were designed to evaluate the Fitbit application using the selected UX frameworks. The survey results were analysed and evaluated to inform the research.

The survey results were analysed and evaluated to identify common themes and areas of improvement for the Fitbit application. The results showed that the application performed well in some areas, but there were areas for improvement in terms of usability, accessibility, and effectiveness.

The final phase of the research involved user testing of the Fitbit application. The user testing was

designed to test the Fitbit application against the selected frameworks' principals and concepts. The testing aimed to identify areas where the application could be improved to enhance the user experience.

The research findings provided insights into the usability, accessibility, and effectiveness of the Fitbit application using the selected UX frameworks. The findings revealed that the application performed well in some areas but had several areas for improvement. The recommendations provided insights into how the application could be improved to enhance the user experience.

Overall, the research process methodology involves several steps, including a background study, a literature review, a survey questionnaire, data analysis, and user testing. The research findings will provide insights into the usability, accessibility, and effectiveness of the Fitbit application using the selected UX frameworks. The recommendations will be provided with insights into how the application could be improved to enhance the user experience. Overall, the research will be highlighted on the importance of incorporating user experience design principles into application design to enhance user engagement and satisfaction while considering the usability, accessibility and effectiveness and the conclusion and the results will be drawn.

3. USER TESTING

User testing is an essential component of analysing the survey results we have collected for our research paper on popular UX frameworks relevant to E-health apps. By observing users as they interact with the Fitbit app and asking for their feedback, we can gain a deeper understanding of their needs and preferences [10] and validate or refute the findings of the survey.

During the user testing sessions, we will ask participants to perform tasks that are relevant to the survey questions. For example, we will ask participants to open the Fitbit app and identify which operating system they are using to run the app. We will also ask participants how often they use the app and whether they feel the app appropriately and promptly updates them when interacting with any system [11].

The survey is held and constructed based on the principals of the selected 3 user experience frameworks. From the user perspective the survey questions will get the answer how in real the user experience principals or followed or conveyed.

Furthermore, we will ask participants whether they feel the Fitbit app shows information in ways that they understand from how the real world operates, and in their language. We will also evaluate whether the app offers users control and lets them undo errors easily, and whether participants feel the app follows consistency and standards in design and user experience.

In addition, we will ask participants whether they feel the app recognizes options and actions, provides flexibility and efficiency of use in the flows, and only focuses on relevant information. We will also evaluate whether the app provides help and documentation, and whether it focuses on people and their context in order to create things that are appropriate for them.

Finally, we will evaluate whether participants feel the app understands and solves the right problems, the root problems, and whether it views everything as a system of interconnected parts. We will also evaluate whether the app incorporates the best of behavioural design and reflective design.

4. RESULTS

Table 1 Nielsen’s heuristics survey results

Heuristics	Yes	No	Maybe
Visibility of system status	42.1%	3.5%	54.4%
Match between system and the real world	71.9%	0%	28.1%
User control and freedom	70.2%	12.3%	17.5%
Consistency and standards	93%	1.8%	5.3%
Error prevention	50.9%	14%	35.1%
Recognition rather than recall	71.9%	7%	21.1%
Flexibility and efficiency of use	68.4%	12.3%	19.3%
Aesthetic and minimalist design	64.9%	7%	28.1%
Recover from errors	71.9%	7%	21.1%
Help and documentation	61.4%	7%	31.6%

Does Fitbit app has the best of visual experience?

57 responses

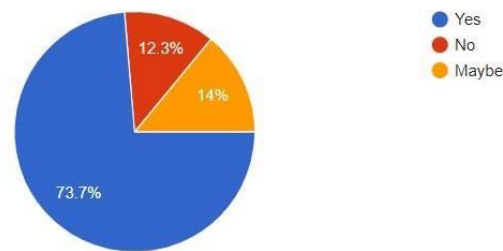


Figure 1 HCD Visual Experience Survey Result

Do you think Fitbit app focus on people and their context in order to create things that are appropriate for them?

57 responses

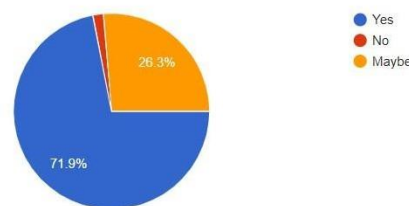


Figure 2 Norman's Triad People Focus Survey Result

In terms of usability, users generally found the app to be consistent with standards (93%) and offer flexibility and efficiency in its flows (68%). Additionally, users reported that the app offers help (71%) and documentation (61%) and recognizes options and actions (71%).

Regarding design principles, users felt that the app followed the principles of human-centred design (71%) and presented information in a way that was understandable (71.9%). Additionally, users reported that the app provides a good visual (73%) and behavioural design (77%) experience.

However, some areas for improvement were identified. For example, users felt that the app could better avoid errors or warn users before they take risky actions (50.9%) and could focus more on relevant information (64%). Additionally, users were unsure if the app understood and solved the right problems (54%) and whether it fully recognized everything as a system of interconnected parts (35%).

According to the survey results, participants rated Human-Centered Design (HCD) the highest in terms of usability, followed by Nielsen Norman Group's 10 Usability Heuristics, and then Don Norman's Three Levels of Design.

HCD emphasizes the importance of understanding and designing for the end user's needs, goals, and context of use, which may explain its high rating.

Nielsen Norman Group's 10 Usability Heuristics, which are principles for designing usable interfaces, were also rated highly. These heuristics include principles such as visibility of system status, user control and freedom, and consistency and standards.

On the other hand, Don Norman's Three Levels of Design, which categorize design into visceral, behavioural, and reflective levels, received the lowest rating. This framework may be seen as more abstract and difficult to apply in practice compared to the other two.

During the testing and evaluation of the FitBit app using the selected UX frameworks, some limitations and deficiencies were also observed. These limitations highlight areas where the app can be improved to enhance the overall user experience.

Error prevention and warning: Participants expressed the need for the app to better avoid errors or provide warnings before users engage in risky actions. This suggests that the app could benefit from incorporating more proactive error prevention mechanisms and informative prompts to guide users and minimize the likelihood of errors.

Relevance of information: Users indicated that the app could focus more on relevant information. This implies that the app could provide more tailored and personalized content, ensuring that the information presented to users is directly related to their specific health goals, preferences, and context. This would help users find the information they need quickly and efficiently.

Systemic understanding: Participants were unsure if the app fully recognized everything as a system of interconnected parts. This suggests that the app could enhance its design by providing a more integrated and cohesive experience. It should emphasize the connections and relationships between different features and functions, allowing users to navigate and interact with the app in a more seamless and holistic manner.

Don Norman's Three Levels of Design: The framework received the lowest rating among the evaluated UX frameworks. This indicates that participants found this framework to be more abstract and challenging to apply in practice compared to the other two frameworks. It may require additional guidance or clarification to make it more accessible and applicable for evaluating and improving the FitBit app's user experience.

5. CONCLUSIONS

In conclusion, the survey results suggest that Fitbit App generally adheres to well-known usability heuristics such as Nielsen Norman Group's 10 Usability Heuristics and Don Norman's Three Levels of Design. However, there is room for improvement in terms of error prevention, information relevancy, and systemic understanding.

Furthermore, the results indicate that Human-Centered Design and Nielsen Norman Group's 10 Usability Heuristics are perceived as more practical and applicable frameworks for designing user interfaces. These findings highlight the importance of incorporating user-centred design principles in UI design and suggest that usability heuristics should be considered as a valuable tool for evaluating and improving the usability of interfaces.

Overall, this survey provides valuable insights into the usability of the Fitbit App and the effectiveness of different UI design frameworks. These findings have implications for designers, developers, and researchers working in the field of UI design and usability and underscore the need for continued efforts to enhance the usability of digital interfaces.

6. FUTURE SCOPE

Future research could focus on investigating the specific areas where the Fitbit App can be improved to align better with the principles of Human-Centered Design and the Nielsen Norman Group's 10 Usability Heuristics. For instance, error prevention and information relevancy are identified as areas that require attention in the current study. Researchers could explore how to improve these aspects using design patterns and best practices suggested in the literatures [16] [17].

Furthermore, the systemic understanding of the FitBit app can be further advanced by applying Don Norman's Three Levels of Design. This framework encompasses not only practical usability but also the emotional and behavioural aspects of the user experience. Future research can explore ways to design interfaces that provide a more seamless and coherent experience for users, taking into account the various contexts and situations in which the app is used [13]. This may involve considering the app's interactions with wearable devices, integrating social features, or incorporating personalized feedback mechanisms to enhance the overall user experience.

Overall, the future scope of improvements in the FitBit app lies in refining and optimizing its design to better align with the principles of Human-Centered Design and the Nielsen Norman Group's 10 Usability Heuristics. Researchers can leverage the insights gained from these frameworks to guide the iterative design process and address the identified limitations. By incorporating design patterns, best practices, and considering the emotional and behavioural dimensions of user experience, the FitBit app can evolve into a more user-centric and engaging platform.

It is worth noting that continuous user feedback and engagement are crucial for driving these improvements. Future research could involve conducting user studies, surveys, and interviews to gather insights and preferences directly from FitBit app users. This feedback-oriented approach can provide valuable input for iterative design processes, aiding in the development of new features and enhancements that better meet user needs and expectations.

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