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# *EVALUATION OF USER EXPERIENCE (UX) HNI MOBILE USING THE THINK ALOUD METHOD*

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***Abstract***

*User experience (UX) evaluation is important to determine the quality of a product or service. This research evaluates the UX of the HNI Mobile application using the think aloud method which asks users to express their thoughts while using the system. Involving 5 respondents who performed 10 task scenarios. The respondents' verbalization data, transcribed, and analyzed with NVIVO 12. The results obtained 5 main codes/themes of problems, namely profile editing, language features, member notifications, feature layout, and feature upgrades, which were visualized in a mind map. A retrospective probing technique was used to understand user difficulties. Although the main features functioned well, some respondents experienced difficulties in using the supporting features such as edit profile, change language, and access notifications. These findings provide input to improve the user experience of the HNI Mobile app in the future*.

**Keywords**: *Evaluation, Mobile Application, Think Aloud, User Experience.*

## 1. INTRODUCTION

User Experience (UX) is a key factor in assessing product or service quality, encompassing user perceptions and responses including emotions, beliefs, and physical and psychological responses [1]. Google Trends data from 2019 to 2024 shows significant growth in UX research, with minimum scores between 75 and 94. Some popular keywords include experience design, user experience design, and ux [2].

User experience evaluation (UX) is the process of assessing a person's perceptions and responses to a product, system, or service based on their use or expectations [3]. To evaluate user experience, one approach is to identify and analyze user reviews based on their perceptions and responses to the application [4].

The easier the system is to use, the better the user experience [5]. One of them is the HNI mobile app. However, based on reviews on the Google Play Store, this application is experiencing user experience problems. Users complained about a complicated login process and feature errors without providing sufficient details. This could potentially lead to misconceptions about the quality of the app. Therefore, further evaluation of the user experience of the HNI Mobile app is needed.

One method used to evaluate user experience is think aloud. Think aloud is an approach where the evaluator is asked to express his/her thoughts while testing and operating a system during the evaluation. It can also be referred to as doing, thinking, and talking [6].

As for some previous research used as literature review material, such as research conducted by [7] There are three usabiliy problems identified. Several recommendations have been proposed to improve the quality of the application. based on the usabiliy problems identified.

Furthermore [8] conducted an evaluation using think aloud. The study showed that various aspects of the website and the evaluation task (think aloud) had similar effects on user experience (UX). And this correlates sub-standardly with UX components.

Research from [9] discusses how to test the attractiveness, and perceived usefulness of the design of a safer application for students. and the final result of this research is, there are some suggested changes to the functionality.

Research from [10] shows that app usage is influenced by social influence and perceived utility, and that trusted apps can alleviate concerns regarding data protection and accuracy, but their implementation needs to be improved to meet user needs and expectations.

Research from [11] conducted an evaluation of the app. It found that the app provided important features for a variety of everyday purposes. Study participants rated the app as effective for da exploration and understanding.

Research from [12] shows that, the think aloud approach generates suggestions and reviews to improve future applications.

Research from [13] uses think aloud complementing eye tracking experiments to explain how user experience can be improved in fashion m-retail systems.

Research from [14] conducted a think aloud evaluation that provided varied data on understanding different aspects of UX.

Research from [15] obtained a qualitative data using think aloud, with direct feedback data from users about their experience interacting with the application.

Research from [16] investigated user preferences through think aloud sessions and conducted a usability study comparing two prototypes.

This research, has differences with previous research. This research uses NVIVO 12 tools to analyze tasks and interviews. Then the data is presented in the form of a mind map. In addition, this research also applies retrospective probing techniques to gain a deeper understanding.

## 2. RESEARCH METHODS

In this research, the think aloud method was used to evaluate the us-er experience for the HNI mobile application. Participants were given a test scenario containing tasks to be completed. This method aims to reveal participants subjective attitudes towards a product [16]. There are six stages of think aloud implementation according to the book [17]. Figure 1 represents the stages of this research.

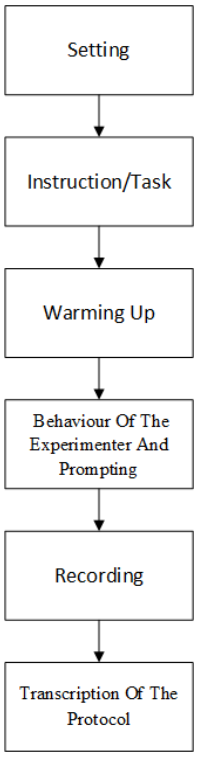


Figure 1. Think Aloud Procedure

In the first stage is setting, which is reparing a comfortable environment, preparing materials needed for the research, and a clear explanation of the purpose of the research. Next is the instruction stage, The instructions or tasks to be done should be given as usual. The instruction in think aloud is to do the task and verbalize what comes to mind. next warming up stage, Give participants a simple warm-up task to familiarize them with the think aloud procedure before the main task. The warm-up task should be easier but still similar to the main research task. Next do Behavior Of The Experimenter And Prompting, If the participant is silent for a long time, the researcher can give a simple gesture such as “Please keep talking” or a nod of the head to get the participant to express their thoughts again. Next do recording, hese sessions are usually recorded in audio or video. It may be useful to include an instruction and practice phase, so that you can check afterwards if the procedure was done correctly. Next do Transcription Of The Protocol, Once the recordings are obtained, transcribe them verbatim by noting all of the participant's utterances including word repetition, sentence revision, etc.

### 2.1. Data Collection

The data collection process in this study began with observation of user reviews on Google Playstore to identify problems that are often faced by users of the HNI Mobile application. Furthermore, researchers conducted direct observations at the Pangkalan Kerinci Business Center to gain contextual insights into the use of applications in the field. Sampling was carried out using purposive sampling technique.

Purposive sampling is the main sampling strategy used in qualitative research. Purposive sampling is based on deliberate selection by researchers based on certain considerations or criteria. The purpose of purposive sampling is to to select respondents who are rich in information and able to provide an in-depth understanding of the research topic. of the research topic. Participants are chosen intentionally because they are considered capable of providing the best perspective on the phenomenon under study. The number of participants was not predetermined but rather based on the level of richness of Information [18].

Researchers can select samples with certain considerations and criteria that can provide informative data in accordance with the research objectives. The sample that the researcher took was 5. Determination of the number of respondents as many as 5 is based on research [19] and [20].

Then, the think aloud method was applied, where each user was asked to complete a specific task within the app while verbally expressing their thoughts. A think aloud analysis was conducted to identify the difficulties and obstacles that users experienced while interacting with the app. To gain a deeper understanding, the researcher conducted a retrospective probing technique. The retrospective

probing technique is used to dig deeper into the causes of difficulties and the frequency of occurrence of problems [21].

Finally, the data obtained from this entire process was then analyzed using the NVivo 12 tool, which allows researchers to code the data and present it in the form of mind maps, making it easier to identify patterns and main themes from the research results."

### 2.2. User Experience

User experience is a well-established concept in HCI research and practice. established in HCI (Human Computer Interaction) research and practice, encompassing the concept of usability. UX suggests that interactions with technology systems technology, includes a person's emotions before, during, and after using the system and cannot be defined simply by studying the basic attributes of the system. the system and cannot be defined simply by studying the basic attributes of such as effectiveness, efficiency, and user satisfaction. Measuring UX becomes a much more complicated endeavor when the target of interaction is not just the system [22].

UX is defined as an individual's responses and perceptions, which stem from the use of a service, product, or system. User experience usually concentrates on a person's experience related to the use of a particular product. The ideology of "usability" is currently widely accepted in the field of user experience. Several studies examined six questionnaires commonly used to assess a system to see if they could be used to measure various aspects of user experience. On the other hand, if the product has high quality, consumers will find it easy, fast, and simple to use, thereby reducing the risk of user error. By making users feel emotionally comfortable, the goal of improving user experience will be achieved [23].

User Experience (UX) is one of the most important elements in product design and development. It helps in the process of product designers and developers to know what the users need and want from the product they want to use. users to the product they want to use. User experience includes all the feelings, thoughts, sensations, and actions of interacting with a product such as a website interface or mobile app. with a product such as a website interface or mobile application [24].

### 2.3. Think Aloud

The think aloud method is also used to understand the sequence of thinking steps that participants go through when they solve a task or problem. Participants will be asked by the researcher to speak continuously about what they are thinking while completing the task without long pauses. This method is useful for understanding the problem-solving process as well as confirming or refining the cognitive models that have been built previously. or refine the cognitive model that has been built before. Participants need to be to think aloud explicitly as this is not natural. natural. They will be given examples and practice in order to be able to think aloud when doing tasks. while working on the task. The results of the participants' thinking process will be analyzed qualitatively qualitatively to answer the research objectives [25]. In think aloud, evaluation is done through a task scenario. Task scenario is created before the actual experiment begins. This scenario consists of questions and tasks for the participants, the wording of which will greatly influence the outcome of the think-aloud method [26]. In think aloud, we can use the performance measurement technique to measure the efficiency level and also the error rate [27], with the following formula.

$$Success = (Number\ of\ Tasks\ Successfully\ Performed)/(Total\ Tasks) \times 100\% \quad (1)$$

There are several scenario tasks that are carried out by the user, the tasks are carried out sequentially according to the instructions given. An illustration of these tasks can be seen in the following table.

Table 1. Task Scenario List

| No. | Task Scenario |
|---|---|
| 1. | Log In to the HNI mobile app |
| 2. | Search for products and view Information about them |
| 3. | Search for testimonials and view Detailed information about them |
| 4. | Search for Information from HNI and Download files of that Information |
| 5. | Access and view digital cards |
| 6. | Search and filter events created by HNI |
| 7. | Change app language |
| 8. | Access notifications for members |
| 9. | Edit user profile |
| 10. | Log out of the HNI mobile app |

## 3. RESULTS

The researcher prepared the tasks to be evaluated, such as logging in, searching for products, searching for testimonials, and changing the profile. In addition, the researcher also provided notes to record the think-aloud sessions.

During the session, participants are allowed to complete the tasks while continuing to vocalize their thought processes. The researcher may ask additional questions if needed, but avoided giving hints or assistance that could affect the participant's performance. All participants' activities and verbalizations during the session were recorded. After that, transcribe the verbal protocol participant.

### 3.1. Task / Instruction Results

In this sub section, we will present the task scenario testing that has been Users are asked to complete 10 task scenarios to evaluate user experience on the main features of the HNI Mobile

application. experience of the main features of the HNI Mobile application. The following is a description of the task scenario testing by 5 users.

Table 2. Task Scenario Results

| | | Task Scenario | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | T1 | T2 | T3 | T4 | T5 | T6 | T7 | T8 | T9 | T10 |
| Responden | R1 | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✖ | ✓ |
| | R2 | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✖ | ✖ | ✓ | ✓ |
| | R3 | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✖ | ✖ | ✓ | ✓ |
| | R4 | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| | R5 | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✖ | ✓ |

Based on the results of the task scenarios in the table above, it can be seen that overall, all users successfully completed Task Scenario 1, 2, 3, 4, 5, and 6. This shows that the login, product search, testimonial search, information search, digital card access, and event filter features function properly without any significant problems. However, for Task Scenario 7, 8, 9 there were several users who failed to complete it. This indicates that the language change, notification access, and profile edit features have potential problems that need to be further evaluated. Meanwhile, all users successfully performed Task Scenario 10 which shows that the application log out feature is running properly. The core features of the HNI Mobile application such as login, search, and log out are functioning properly, but some supporting features such as language, notifications, and profile editing still have potential bugs and problems that need to be fixed based on the results of this test. The processing time of respondents on each task can be seen in the following table..

Table 3. Duration of Task Scneario

| | T1 | T2 | T3 | T4 | T5 | T6 | T7 | T8 | T9 | T10 |
|---|---|---|---|---|---|---|---|---|---|---|
| R1 | 0:4s | 0:6s | 0:3s | 0:9s | 0:3s | 0:8s | 0:1 3s | 0:3s | × | 0:3s |
| R2 | 0:5s | 0:4s | 0:6s | 0:6s | 0:6s | 0:1 2s | × | × | 0:8s | 0:6s |
| R3 | 0:3s | 0:4s | 0:4s | 0:8s | 0:4s | 0:1 0s | × | × | 0:1 0s | 0:4s |
| R4 | 0:3s | 0:5s | 0:4s | 0:9s | 0:4s | 0:1 0s | 0:1 3s | 0:4s | 0:9 s | 0:4s |
| R5 | 0:4s | 0:7s | 0:8s | 0:8s | 0:8s | 0:8 s | 0:1 1s | 0:8s | × | 0:5s |

### 3.2. Performance Measurement

After obtaining data on the number of task scenarios completed by each respondent, the next step is to enter the calculation using the performance measurement shown in the following table.

Table 4. Task Scenario Success Rate

| Respon code | Complete task | Tasks that are done | Successful task |
|---|---|---|---|
| R1 | 9 | 10 | 90% |
| R2 | 8 | 10 | 80% |
| R3 | 8 | 10 | 80% |
| R4 | 10 | 10 | 100% |
| R5 | 9 | 10 | 90% |

### 3.3. Analysis Protocol

After completing the task, and recording all conversations from respondents and transcribing, then the transcription will be analyzed using the Nvivo 12 tool. the following are the results of the data analysis obtained.

Table 5. Coding Scheme

| **Code : Edit Profil** | |
|---|---|
| Number of References | Coverage Percentage |
| 1 | 1. 3,06% |
| 2 | 1. 3,12%<br>2. 5,46% |
| 2 | 1. 2,26%<br>2. 2,56% |
| 2 | 1. 3,50%<br>2. 4,75% |
| Segmentation : 1. Agak sulit mencari cara untuk mengedit profil. 2. Kok susah banget ya cari cara edit profilnya. 3. Seharusnya proses edit profil ini lebih intuitif, agar pengguna tidak bingung. 4. Gagal mengedit profil pengguna. 5. Saya sulit menemukan fitur ini. 6. Agak sulit mencari cara untuk mengedit profil pengguna. 7. Pengaturan profil seharusnya lebih terlihat dan mudah di akses | |
| **Code : Fitur Bahasa** | |
| Number of References | Coverage Percentage |
| 2 | 1. 2,91%<br>2. 4,46% |
| 2 | 1. 3,58%<br>2. 3,66% |
| Segmentation : 1. Kayaknya nggak ada opsi buat ganti Bahasa. 2. Harusnya ada fitur multibahasa nih, jadi lebih nyaman digunakan. 3. Sepertinya nggak bisa ganti bahasanya. 4. Seharusnya ada pilihan Bahasa yang lebih banyak. | |
| **Code : Notifikasi Member** | |
| Number of References | Coverage Percentage |
| 2 | 1. 3,61%<br>2. 4,54% |
| 1 | 1. 3,11% |
| Segmentation : 1. Sepertinya nggak bisa diakses notifikasi untuk member. 2. Mungkin perlu ditinjau lagi fiturnya agar lebih mudah dipahami. 3. Tampaknya nggak bisa diakses notifikasinya. | |
| **Code : Tata Letak Fitur** | |
| Number of References | Coverage Percentage |
| 2 | 1. 4,06%<br>2. 3,46% |
| Segmentation : 1. Mungkin pengaturan profil bisa ditempatkan lebih jelas. 2. Ditampilkan di tempat yang mudah diakses. | |
| **Code: Tingkatkan Fitur** | |
| Number of References | Coverage Percentage |
| 1 | 1. 6,39% |
| 2 | 1. 7,63%<br>2. 5,37% |
| Segmentation : 1. Sepertinya fitur perluditingkatkan agar lebih mudah diakses dan dioperasikan oleh pengguna. 2. Pengembang perlu memperbaiki hal ini agar pengguna bisa mendapatkan Informasi penting dengan mudah. 3. Saya harap pengembang terus mempebarui aplikasinya agar semakin baik. | |

After successfully obtaining codes or themes obtained from re-reading the interview data segments. The result is 5 codes or themes (nodes). Furthermore, the code will be visualized, so that it will become clearer information. Researchers will visualize the data in the form of a mind map. As shown in the figure 2.

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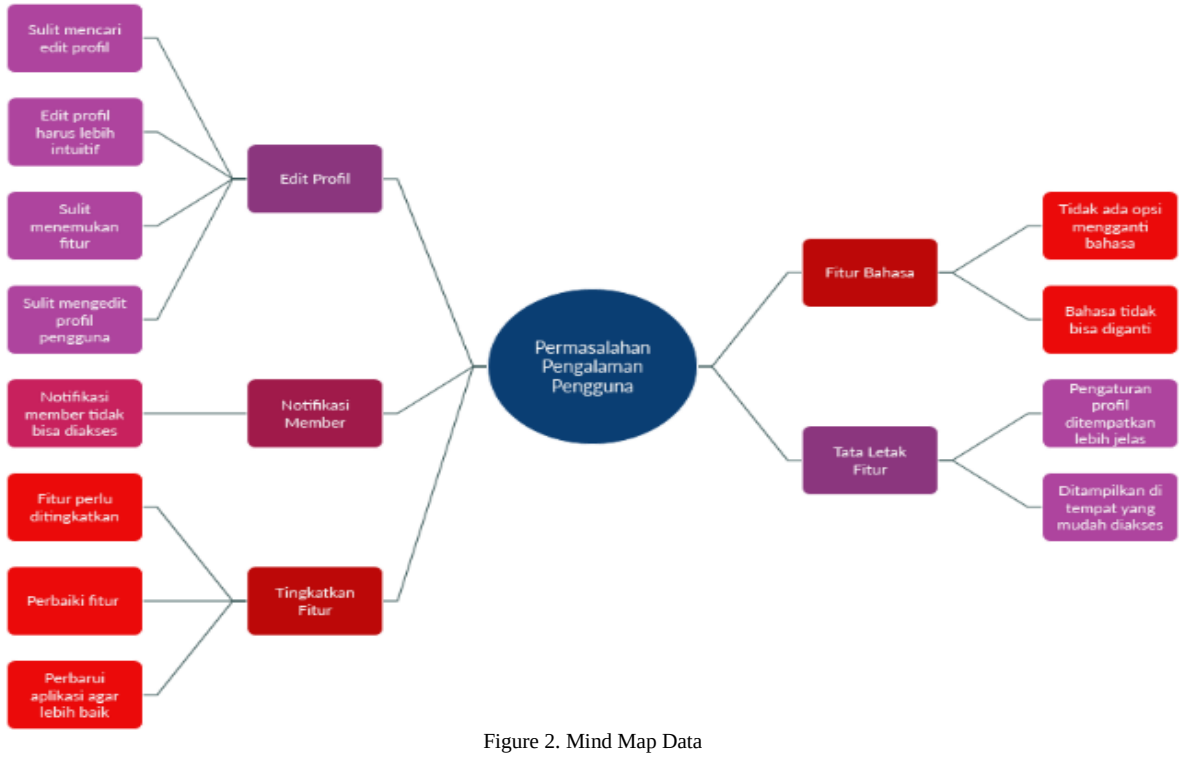


Figure 2. Mind Map Data

Based on the mind map provided, it can be analyzed that there are several main problems related to user experience in an application or website. One of the most prominent issues is related to language features that are not available or do not work properly. This can certainly hinder the user experience, especially for those who don't use the default language in the application.

Another significant issue is related to the management of user profiles. Some of the

issues identified here include the difficulty of editing profiles. This can make users feel confused and reduce their satisfaction in using the app or website.

In addition, the mind map also shows issues related to feature availability and functionality. Users need additional features that are not yet available, or encounter existing features that do not function properly or need to be improved. This can hinder the flow of the user experience and reduce the efficiency of using the app or website.

Another aspect that was highlighted was the layout and organization. Non-optimized feature arrangement, unclear profile settings, and inaccessible app interfaces can cause confusion and friction for users. Finally, the mind map also lists the need for app updates or improvements to make it better and optimized.

Overall, this mind map provides a comprehensive overview of the various problems that users face in using an app or website. To improve the user experience, it is imperative for developers to identify and address these issues systematically.

After displaying the data through mind maps, retrospec-tive probing followed. By giving a series of questions to users about their experience and suggestions for improvements to the HNI mobile app after completing the given task. The following is the retrospective probing table.

### 3.4. Retrospective Probing

In the retrospective probing stage, the researcher involved asking users a series of questions about their experiences and suggestions for improvements to the HNI mobile application after completing the assigned tasks. The following suggestions for improvement were given by the users.

Tabel 6. Retrospective Probing

| |
|---|
| **Original form of question (Respondent 1):** |
| How was your experience when trying to edit your profile in the HNI Mobile app? |
| **Probes:** a) What happens when you try to edit a profile? |
| b) Are you trying to find solutions to overcome these difficulties? |
| c) Does this difficulty occur every time you try to edit your profile? |
| **Result :** The first user had trouble every time he tried to edit his profile. When asked what happened, the user explained that every time he tried to save changes to the profile, it always failed. He felt confused by the situation and didn't know what to do to find another solution. |
| |
| **Original form of question (Respondent 2):** |
| How was your experience when trying to change the language and access member notifications in the app? |
| **Probes:** a) What happens when you try to change the language or access member notifications? |
| b) Are you trying to find solutions to overcome these difficulties? |

| |
|---|
| c) Does this happen every time you try to change the language or access member notifications? |
| **Result :** The second user had difficulty using the language change feature and accessing member notifications. He could not find the option to change the language. He did not try to find another solution because he did not know what to do. She has had this difficulty every time since she first tried it. |

| **Original form of question (Responden 3):** |
|---|
| How was your experience when trying to change the language and access member notifications in the app? |
| **Probes:** a) What happens when you try to change the language or access member notifications? |
| b) Are you trying to find solutions to overcome these difficulties? |
| c) Does this happen every time you try to change the language or access member notifications? |
| **Result:** The third user revealed that every time he tried to change the language and access member notifications, he always experienced the same difficulty. The user didn't know there was a member notification feature. He tried to find a solution but was unsuccessful. He always experienced this difficulty for the first time when the researcher gave him a task. |

| **Original form of question (Respondent 4):** |
|---|
| What is your experience when using the features in the HNI Mobile app? |
| **Probes:** a) What happens when you try to use these features? |
| b) Are you having trouble understanding how to use these features? |
| c) Do you experience any difficulties every time you use these features? |
| **Result:** The fourth user stated that he never experienced any difficulties every time he used the features in the HNI Mobile application. All features have always worked well since the first time he tried them. |

| **Original form of question (Respondent 5):** |
|---|
| How was your experience when trying to edit your profile in the HNI Mobile app? |
| **Probes:** a) What happens when you try to use these features? |
| b) Are you trying to find solutions to overcome these difficulties? |
| c) Does this difficulty occur every time you try to edit your profile? |
| **Result:** The fifth user explained that every time he tried to edit his profile, he had trouble. He was unable to save the changes and felt confused. When asked if he looked for a solution, he stated that he tried reading the user guide but did not find an effective solution. He confirmed that this problem occurred every time he tried to edit the profile |

## 4. DISCUSSION

This study aims to evaluate the user experience (UX) of the HNI Mobile application using the think aloud method. The evaluation results show that in general the main features of the application have functioned well, as seen from the high percentage of successful task completion, which is above 80%. This finding is in line with previous research that emphasizes the importance of focusing on user experience in application development.

The results showed that in general, the main features of the HNI Mobile application such as login, product search, testimonial search, information search, digital card access, and event filters functioned well. However, some users experience difficulties in using supporting features such as editing profiles, changing languages, and accessing notifications for members.

This finding is in line with previous research conducted by [8] who used the think aloud method to evaluate usability and user experience scenarios. Their research found that website aspects and evaluation tasks (think aloud) have similar effects on user experience (UX), and correlate with UX components.

The results of this study are also in line with a study conducted by [10] who found that users need additional features and improvements to health and well-being applications to meet their needs and expectations. Similar findings were also obtained in the study of [11] who evaluated a web application for understanding electronic health record data, where users provided feedback for improved features and user experience.

Overall, this research makes an important contribution in understanding the user experience on the HNI Mobile app and identifying areas for improvement. By using the think aloud method, the researcher was able to capture the user's perspective in more depth and provide appropriate recommendations for future app improvements.

## 5. CONCLUSION

This research evaluates the user experience of the HNI Mobile application using the think aloud method. Involving 5 respondents who performed 10 task scenarios related to the main features of the application. The evaluation results show that core features such as login, product search, testimonial search, information search, digital card access, and event filters function well without significant problems. However, some respondents experienced difficulties in using supporting features such as editing profiles, changing languages, and accessing notifications for members.

Analysis of respondents verbalization data transcribed and processed with NVIVO 12 resulted in 5 main codes or problem themes, namely profile editing, language features, member notifications, feature layout, and feature enhancement. These findings were visualized in the form of a mind map to facilitate the identification of patterns and main topics. Furthermore, retrospective probing techniques were used to gain a deeper understanding of the difficulties experienced by users.

Although the main features of the HNI Mobile app function well, there is still room for improvement, especially in the aspect of supporting features. The findings from this study provide valuable input for app developers to improve the overall user experience in the future. Improvements to areas such as the profile editing process, availability of language options, notification accessibility, feature layout, and feature updates can help increase user satisfaction and comfort in using the HNI Mobile application.

## REFERENCES


[1] I. Díaz-Oreiro, G. López, L. Quesada, and L. Guerrero, "Standardized Questionnaires for User Experience Evaluation: A Systematic Literature Review," no. October 2018, p. 14, 2019, doi: 10.3390/proceedings2019031014.

[2] "user experience - Pelajari - Google Trends." https://trends.google.co.id/trends/explore?date=today 5-y&q=user experience&hl=id (accessed Mar. 30, 2024).

[3] Mochammad Aldi Kushendriawan, Harry Budi Santoso, Panca O. Hadi Putra, and Martin Schrepp, "Evaluating User Experience of a Mobile Health Application 'Halodoc' using User Experience Questionnaire and Usability Testing," *J. Sist. Inf.*, vol. 17, no. 1, pp. 58–71, 2021, doi: 10.21609/jsi.v17i1.1063.

[4] B. Alsanousi, A. S. Albesher, H. Do, and S. Ludi, "Investigating the User Experience and Evaluating Usability Issues in AI-Enabled Learning Mobile Apps: An Analysis of User Reviews," *Int. J. Adv. Comput. Sci. Appl.*, vol. 14, no. 6, pp. 18–29, 2023, doi: 10.14569/IJACSA.2023.0140602.

[5] A. G. Imana and Y. S. Nugroho, "Ux (User Experience) Evaluation of the Openlearning System At Universitas Muhammadiyah Surakarta Using Heuristic Evaluation and Usability Testing," *J. Tek. Inform.*, vol. 4, no. 4, pp. 681–691, 2023, doi: 10.52436/1.jutif.2023.4.4.824.

[6] C. Cheng and C. Tristan, "Integrating heuristics and think - aloud approach to evaluate the usability of game - based learning material," vol. 8, pp. 137–157, 2021.

[7] Z. A. Nasruddin, A. Markom, and M. Abdul Aziz, "Evaluating construction defect mobile app using think aloud," *Commun. Comput. Inf. Sci.*, vol. 886, no. 2, pp. 3–11, 2018, doi: 10.1007/978-981-13-1628-9_1.

[8] A. K. Trukenbrod, N. Backhaus, and R. Thomaschke, "Measuring subjectively experienced time in usability and user experience testing scenarios," *Int. J. Hum. Comput. Stud.*, vol. 138, no. January, p. 102399, 2020, doi: 10.1016/j.ijhcs.2020.102399.

[9] J. G. Smith, N. S. Alamiri, G. Biegger, C. Frederick, J. P. Halbert, and K. S. Ingersoll, "Think-Aloud Testing of a Novel Safer Drinking App for College Students During COVID-19: Usability Study," *JMIR Form. Res.*, vol. 6, no. 2, 2022, doi: 10.2196/32716.

[10] D. Szinay, O. Perski, A. Jones, T. Chadborn, J. Brown, and F. Naughton, "Influences on the uptake of health and well-being apps and curated app portals: Think-aloud and interview study," *JMIR mHealth uHealth*, vol. 9, no. 4, 2021, doi: 10.2196/27173.

[11] D. Nakikj, D. Kreda, and N. Gehlenborg, "New Ways for Patients to Make Sense of Their Electronic Health Record Data Using the Discovery Web Application: Think-Aloud Evaluation Study," *JMIR Form. Res.*, vol. 7, 2023, doi: 10.2196/41346.

[12] K. Ishaq, F. Rosdi, N. A. M. Zin, and A. Abid, "Heuristic And Think Aloud Method To Evaluate The Low Fidelity Prototype Of Game-Based Language Learning Application," *4th Int. Conf. Innov. Comput. ICIC 2021*, no. Icic, 2021, doi: 10.1109/ICIC53490.2021.9693022.

[13] Z. Tupikovskaja-Omovie, "Enhancing User Experience in Fashion m-Retail: Mapping Shopping User Journey Using Google Analytics, Eye Tracking Technology and Retrospective Think Aloud Interview," *Fash. Pract.*, vol. 14, no. 3, pp. 352–375, 2022, doi: 10.1080/17569370.2022.2129466.

[14] H. Virtanen, "Methods for evaluating user experience in small agile teams: a case study," 2022.

[15] E. Oliveira *et al.*, "End-user Evaluation of a Mobile Application Prototype for Territorial Innovation," *Int. Conf. Enterp. Inf. Syst. ICEIS - Proc.*, vol. 2, no. Iceis, pp. 495–504, 2021, doi: 10.5220/0010479104950504.

[16] M. Ahmed, K. M. Ying, and K. E. Boyer, "User-centered design of a mobile java practice app: A comparison of question formats," *SIGCSE 2020 - Proc. 51st ACM Tech. Symp. Comput. Sci. Educ.*, pp. 1158–1164, 2020, doi: 10.1145/3328778.3366942.

[17] R. N. Lindstrom and A. De Havilland, *Conducting the review of demonstrations for higher operating value for landfill wells*. 2017.

[18] K. M. Staller, "Big enough? Sampling in qualitative inquiry," *Qual. Soc. Work*, vol. 20, no. 4, pp. 897–904, 2021, doi: 10.1177/14733250211024516.

[19] B. Noushad, P. W. M. Van Gerven, and A. B. H. de Bruin, "Twelve tips for applying the think-aloud method to capture cognitive processes," *Med. Teach.*, vol. 0, no. 0, pp. 1–6, 2023, doi: 10.1080/0142159X.2023.2289847.

[20] P. M. Zaini *et al.*, *Metodologi Penelitian Kualitatif*, no. May. 2023.

[21] J. H. Birns, K. a Joffre, J. F. Leclerc, and C. A. Paulsen, "Getting the Whole Picture : Collecting Usability Data Using Two Methods — Concurrent Think Aloud and Retrospective Probing," *Usability Prof. Assoc. Conf. July*, pp. 8–12, 2002.

[22] S. Ntoa, G. Margetis, M. Antona, and C. Stephanidis, "User Experience Evaluation in Intelligent Environments: A Comprehensive Framework," *Technologies*, vol. 9, no. 2, 2021, doi: 10.3390/technologies9020041.

[23] C. Neilson and P. Grigore, "Machine Learning and AI Application Behaviour Prediction for User Experience Modelling and Optimization," *J. Comput. Nat. Sci.*, vol. 2, no. 3, pp. 120–131, 2022, doi: 10.53759/181x/jcns202202015.

[24] G. S. C. A. B. N. H. M. Z. , Muhammad Omar, Farhana Diana Deris, "User Experience in Product Design and Development: Perspectives and Strategies," *Math. Stat. Eng. Appl.*, vol. 71, no. 2, pp. 257–262, 2022, doi: 10.17762/msea.v71i2.83.

[25] M. D. Wolcott and N. G. Lobczowski, "Using cognitive interviews and think-aloud protocols to understand thought processes," *Curr. Pharm. Teach. Learn.*, no. xxxx, pp. 0–1, 2020, doi: 10.1016/j.cptl.2020.09.005.

[26] T. Vanicek and S. Popelka, "The Think-Aloud Method for Evaluating the Usability of a Regional Atlas," *ISPRS Int. J. Geo-Information*, vol. 12, no. 3, 2023, doi: 10.3390/ijgi12030095.

[27] I. M. Candiasa, I. G. A. Gunadi, and I. N. W. S. Putra, "UX Evaluation Using Firstclick, Performance Measurement, RTA, And Questionnaire On E-Commerce Website," *Sinkron*, vol. 8, no. 1, pp. 451–460, 2023, doi: 10.33395/sinkron.v8i1.12037.