

Application of User-Centered Design Method in Redesign of The iPusnas Digital Library Interface Based on User Experience Evaluation

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ABSTRACT

The low interest in reading in Indonesia is due to several inhibiting factors. One of the biggest obstacles is the limited access to libraries, books, and other literacy resources. Therefore, the National Library has made efforts to develop digital library services, namely iPusnas. However, this digital transformation does not always run smoothly. Some users have reported that the iPusnas app interface is considered too old-fashioned, boring, and confusing. Some users also complained about the lack of sort and filter features, book grouping, and so on. Therefore, a redesign is needed. This study uses the User-Centered Design (UCD) method to identify all user needs and issues and to create a solution for the iPusnas interface. Through two iterations of testing, the results of the first iteration showed a System Usability Scale (SUS) score of 82.72 out of 100 and a Net Promoter Score (NPS) of 55.56 out of 100. The second iteration showed a System Usability Scale (SUS) score of 86.27 out of 100 and a Net Promoter Score (NPS) of 73.33 out of 100. Overall, the evaluation results improved and met user needs.

Keywords : ipusnas, user-centered design, redesign, user experience, digital library

1. INTRODUCTION

Indonesia is one of the countries with a relatively low interest in reading or literacy. However, one of the main foundations for the development of individuals and the nation is literacy. A literate society will have knowledge, creativity, and productivity. According to a survey by UNESCO, Indonesia has the lowest reading interest in ASEAN, with a reading index of only 0.001 percent. This means that out of 1,000 people in Indonesia, only one person has a high interest in reading. Additionally, according to the "most literate nation in the world" study conducted by Central Connecticut State University in 2016, Indonesia ranked 60th out of 61 countries (Nasrullah & Tawakkal, 2021). However, the low interest in reading in Indonesia is due to several inhibiting factors. One of the biggest obstacles is the limited access to libraries, books, and other literacy resources. Deni Kurniadi, Deputy for Resource Development at the National Library of Indonesia (Perpusnas), stated that the ratio between the number of collections in regional libraries and the population in Indonesia is 1:90. This means that one book title has a queue of 90 people. Therefore, Perpusnas is making efforts to address the urgent book situation in Indonesia by developing digital library services, namely iPusnas (Meinita, 2022).

iPusnas is a digital library application based on social media. This application is a result of the collaboration between the National Library of Indonesia (Perpusnas) and Aksaramaya as the app developer. The purpose of this application is to make it easier for Indonesians to obtain digital reading materials with legal licenses. With this digital library, it is hoped that the reading habits of the community will shift from print to digital, eliminating the need to carry physical books or visit the National Library in person (Ryza, 2016). However, this digital transformation does not always run smoothly. There are issues with the iPusnas application, particularly regarding the interface and the

system's reliability in providing reading materials. Several considerations for redesigning the application's interface include an outdated design, poor ratings, many negative reviews, below-standard metrics, and so on (Mayka, 2022).

Some previous studies that discussed redesign using the User-Centered Design method include a study titled "Application of User-Centered Design Method in Redesigning the MAN 1 Pasuruan Website." This study aimed to provide design recommendations as an effort to build a positive image as an Islamic-based educational institution, thereby enabling it to compete competitively with general schools. The research began with measuring the System Usability Scale (SUS) and proceeded to the evaluation stage. The System Usability Scale (SUS) score before the redesign was 27.35, while after the redesign, the SUS score achieved was 88.33, which falls under the "Excellent" rating, indicating that the website's appearance met user needs (Cahyani & Indriyanti, 2022).

Therefore, based on this background, this can serve as the foundation for this study. The method used in this research is User-Centered Design. The result of this study is a prototype of the user interface design for the iPusnas digital library application, aimed at creating an interface solution that addresses issues based on user experience. The hope is to produce improvement recommendations that can meet user needs and be easily used by iPusnas application users.

2. RESEARCH METHOD

User-Centered Design is a method used by developers and designers to ensure that they create products that meet user needs (Lowdermilk, 2013). Another definition of User-Centered Design, which is often used synonymously with the term Human-Centered Design, is an approach to design and system development aimed at creating useful interactive systems with a focus on system use and the application of human factors/ergonomics and usability knowledge and techniques (ISO 9241-210, 2019). The stages conducted in this research are as follows (L. Albani & G. Lombardi (FIMI), 2010), as shown in Figure 1 :

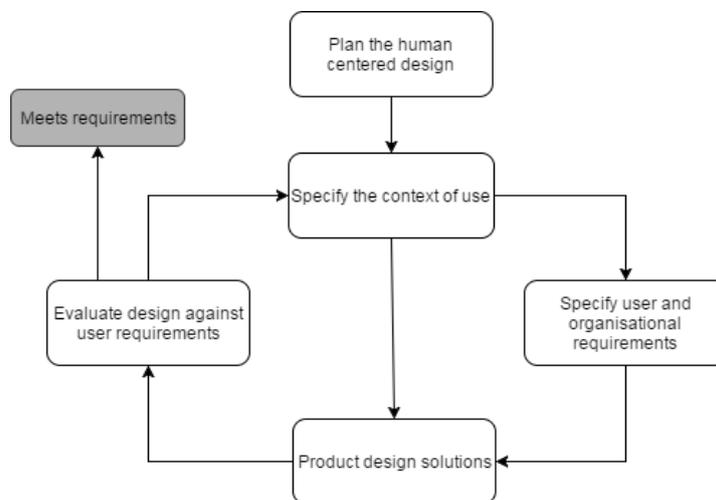


Figure 1. User-Centered Design Method

1. Plan the Human-Centered Process

The first stage of this method involves planning the human-centered process by identifying user-involved problems from the beginning to the end of the process if necessary to apply a user-centered design philosophy. Initial problem identification is done through observation.

2. Specify the Context of Use

The second stage in this method is to determine the context of system use by identifying the characteristics of the intended users and the system's goals for each type of user. The outcomes include user characteristics, tasks that users will perform, and the system

usage environment. Further problem identification and user needs are determined through questionnaires and interviews.

3. Specify User and Organizational Requirements

The third stage in this method is to determine user and organizational needs connected with the context of use by identifying requirements for the system to be developed. The acquisition and analysis of requirements are considered crucial steps for system development. User personas and empathy maps are created based on interview results.

4. Produce Design Solutions
The fourth stage in this method is to create potential design solutions according to user needs analysis. This stage begins with designing conceptual design solutions, detailing designs, receiving feedback to improve the design, and iterating the process until the goals are achieved. The final result of this process is a prototype presented to users.

5. Evaluate Designs Against User Requirements
The final stage in this method is to evaluate designs against user requirements by testing design solutions to assess whether the proposed design solutions have met user needs or not. The outcomes of this process include testing data and user feedback, which are crucial for design improvements. Usability testing is conducted using the System Usability Scale (SUS), consisting of a total of ten questions as listed in Table 1.

Table 1. System Usability Scale (SUS) Questions

No.	Questions
1.	I think that I would like to use this system frequently
2.	I found the system unnecessarily complex
3.	I thought the system was easy to use
4.	I think that I would need the support of a technical person to be able to use this system
5.	I found the various functions in this system were well integrated
6.	I thought there was too much inconsistency in this system
7.	I would imagine that most people would learn to use this system very quickly
8.	I found the system very cumbersome to use
9.	I felt very confident using this system
10.	I needed to learn a lot of things before I could get going with this system

The threshold value set is 68. This number is derived from the average result of an extensive study conducted by Jeff Sauro across 500 studies on various different systems. Here is the range of System Usability Scale (SUS) values, as seen in Table 2 (Sukma et al., 2023).

Table 2. System Usability Scale (SUS) Score Range

SUS Score	Grade	Adjective Ratings	Acceptability Ranges
84.1 – 100	A+	Best Imaginable	Acceptable

80.8 – 84.0	A	Excellent	
78.9 – 80.7	A-	Good	
77.2 – 78.8	B+		
74.1 – 77.1	B		
72.6 – 74.0	B-		
71.1 – 72.5	C+		
65.0 - 71.0	C	OK	Marginal High
62.7 – 64.9	C-		Marginal Low
51.7 – 62.6	D		
0 - 51.6	F	Poor / Worst Imaginable (0-25)	Not Acceptable

The next test is measuring user loyalty using the Net Promoter Score (NPS). Net Promoter Score (NPS) questions use a scale of 1-10 and have a range of values between -100 to 100 (Fessenden, 2024). A negative score is obtained if there are more detractors than promoters, while a positive score is obtained if there are more promoters than detractors. An NPS of zero indicates an equal number of detractors and promoters. The closer the NPS is to 100, the better the score. Here is the equation for calculating the Net Promoter Score (NPS).

$$Score\ NPS = \frac{Promoters\ x\ 100}{Total\ Responden} - \frac{Detractors\ x\ 100}{Total\ Responden}$$

3. RESULT AND DISCUSSION

3.1 Plan the human centered design

The "Plan the Human-Centered Process" stage is conducted through observation and literature review to identify initial issues with the iPusnas application and steps to resolve them.

3.1.1 Observation

Initial observations were conducted by observing user posts about their experiences with iPusnas on social media platform X or Twitter. From these observations, complaints were found that the iPusnas application's user interface still needs updating because it is considered outdated and confusing for users. Users also feel that iPusnas does not yet meet their needs, such as the lack of features to change page colors, annotate quotes, and create wishlists as shown in Figure 2. However, the reality differs from the direct observation regarding these features in iPusnas. Features like wishlist and page color customization are actually available in the iPusnas application.

Tapi dari segi ui/ux, ipusnas kalah jauh 😞 sampai sekarang masih gak paham sistem peminjamannya gimana, apakah siapa cepat dia dapat atau berdasarkan antrian? Terus gak bisa masukin buku ke wishlist juga (atau apa saya gak tau caranya?). Masih banyak yg perlu di upgrade

Figure 2. Observation Results of iPusnas User Reviews on X/Twitter

Further observations were conducted by examining ratings and reviews on the Play Store for the Android operating system. Users of iPusnas on Android gave it a rating of 3.4 out of 5, and there are reviews as shown in Figure 3. indicating that users desire a better user interface update and improvements such as adding features like reminders for borrowing deadlines, filtering titles based on book popularity and rating, and categorizing books appropriately so users can easily find books of the same genre.

Ini kenapa pliss buku yg kupinjem ilang semua, apa emg sistemnya bakal otomatis balikin buku yg kita pinjem setelah brp hari??? Sedih banget sih jujur, klo emg sistemnya gitu seengaknya bisa kasih notifikasi ky peringatan batas waktu peminjaman berakhir sampai kapan gitu. Sama bisa sih ini mulai di upgrade dari look dan banyakin fitur nyaa, bisa nambahin filter judul berdasarkan abjad, filter berd. rating atau yg paling banyak dipinjem dll. Semoga bisa jadi masukan dan perbaikan nih!!

Figure 3. Observation Results of iPusnas User Reviews on the Play Store

Further observations were conducted by examining ratings and reviews on the App Store for the iOS operating system. Users of iPusnas on iOS gave it a rating of 2.7 out of 5, and there are reviews as shown in Figure 4. indicating that iPusnas still needs improvement due to issues such as oversized book cover displays, inconsistent language use, and missing features like a bookmark feature for the last page read.

★★★★☆
Esrasantha, 04/10/2023

Masih perlu banyak improvement!
Makasih ipusnas utk buku2 gratis dan legalnya!!! Tapi sedikit masukan dr sy sebagai pengguna:
- tampilan buku yg gede2 kurang efisien. Browsing judul berdasarkan kategori jadi sulit, kadang ditemukan jg buku2 cross category. Misal: sudah pilih kategori fiksi, tp ada buku2 non fiksi yg keluar di page
- aplikasi ga "mengingat" halaman terakhir yg dibaca, harus dibookmark sendiri. Sementara, jk keluar aplikasi sebentar saja, buku yg sedang dibaca sudah auto menutup. Alhasil sy jd harus membiasakan diri menghafal halaman yg sedang sy baca just in case sy lupa bookmark halaman sebelum meninggalkan aplikasi (misal utk sekedar balas chat sebentar)
- saya juga kurang paham dgn perbedaan term yg digunakan, misal "book has been provided" dengan "buku telah tersedia" bedanya bgmn? Mengapa ada template notifikasi yg berbahasa inggris dan ada yg berbahasa indonesia?
- membaca jg kadang agak sulit krn ukuran huruf tidak bisa diatur. Kadang terlalu kecil utk dibaca, tp ketika dizoom tidak bisa pas sesuai ukuran layar.

Overall, banyak aspek yg seharusnya masih bisa diimprove. Tp saya sangat2 mengapresiasi buku gratis dr ipusnas. Semoga ada lebih banyak judul2 lainnya 🙏🙏

Figure 4. Observation Results of iPusnas User Reviews on the App Store

3.2 Specify the context of use

The "Specify the context of use" stage is conducted by distributing questionnaires and conducting interviews to gather user characteristics and their assessments while using the iPusnas application.

3.2.1 Questionnaire

The questionnaire in this study is divided into two parts: general questions, and assessments of the current System Usability Scale (SUS) and Net Promoter Score (NPS) of iPusnas. Respondents of this questionnaire are active iPusnas users who are part of the literacy community on Twitter or X,

namely @literarybase. There were 45 respondents participating in this questionnaire. Based on the questionnaire results, the current System Usability Scale (SUS) assessment for iPusnas is 66.7 out of 100. This score falls into the "OK" category with a grade of C, indicating an acceptable range at a marginal high level, approaching the upper limit of the acceptable category. The current Net Promoter Score (NPS) assessment for iPusnas is 31 out of 100, which is considered a positive NPS. However, the comparison between Promoters and Detractors shows a difference of only 1 respondent (2.2%), indicating a need for improvement to enhance user loyalty.

3.2.2 Interview

The interview consisted of general questions regarding user experience and feedback on the iPusnas application. From the interviews, the results indicated that users faced several challenges, including not being aware of all the features available in iPusnas, a confusing borrowing process, inconsistent interface design, and various bugs such as sudden logouts, missing notifications, and inability to return books promptly. Users suggested several additional features such as notifications for newly added books in iPusnas, a reading summary for the year, and adding a column to view books reviewed by other users.

3.3 Specify the user and organizational requirements

The "Specify the user and organizational requirements" stage is conducted by mapping empathy maps, creating user personas, grouping, and listing all user needs. These serve as references for the design solution stage.

3.3.1 Empathy Map

An empathy map is created by mapping findings based on analysis related to what users say, think, do, and feel while using the application (Gibbons, 2018). Here is the empathy map of iPusnas users as shown in Figure 5.

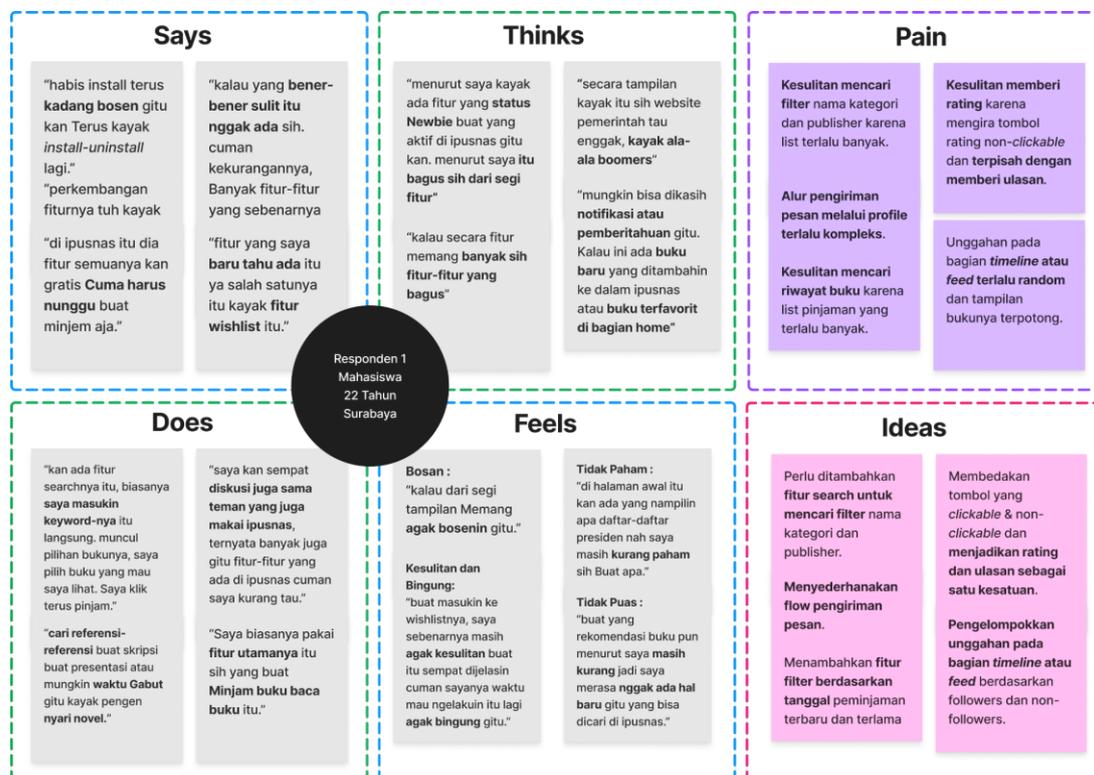


Figure 5. Empathy Map

3.3.2 User Persona

User Persona is a fictional representation of a user character that embodies all the needs of an ideal user (Mubiarto et al, 2023). The User Persona is developed based on the previously created empathy map. Based on these five empathy maps, the persona identified is as follows in Figure 6.



Figure 6. User Persona

3.4 Produce design solutions

The "Produce design solutions" stage involves creating information architecture, wireframes, UI style guides, mockups, and simulating them into a prototype that can interact with users.

3.4.1 Information Architecture

Information architecture is the design structure that outlines the layout of information on application pages (Laubheimer, 2022). Here is the proposed information architecture for the latest design solution (information architecture to-be) as shown in Figure 7.

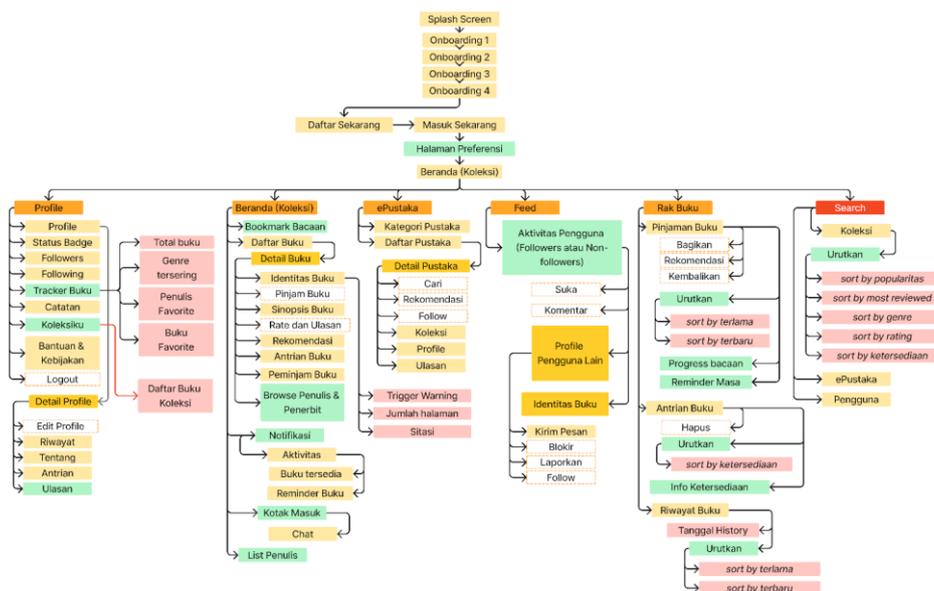


Figure 7. iPusnas information Architecture (to-be)

3.4.2 Wireframe

A wireframe is a framework used to organize elements within the layout of a website or application page before product development begins (Ravelino, 2023). Here is the wireframe for the iPusnas design solution as shown in Figure 8.

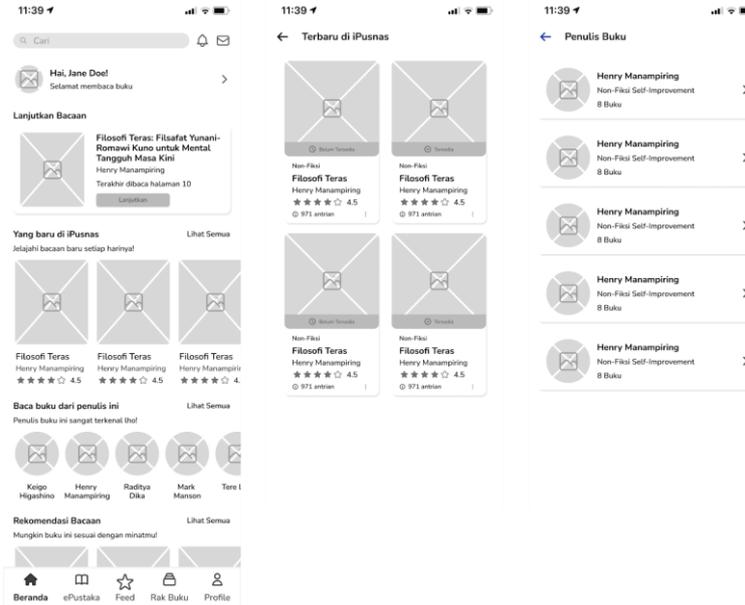


Figure 8. Wireframe

3.4.3 Mockup

Mockup is a visualization of the design concept before it is implemented physically. Typically, a mockup also includes visual aspects such as color composition, images or illustrations, layout, and text (Arisa, 2023). Here is the mockup for the iPusnas design solution as shown in Figure 9.

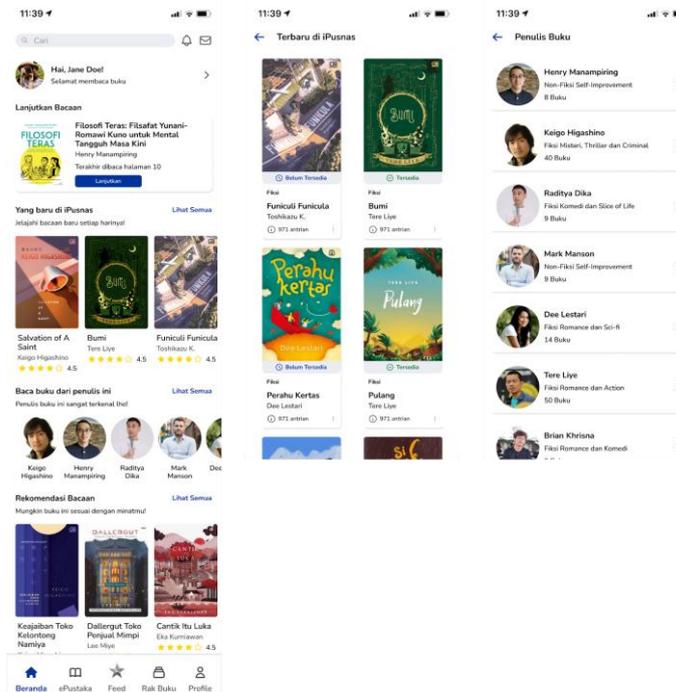


Figure 9. Mockup

3.5 Evaluate designs against user requirements

The "Evaluate designs against user requirements" stage is conducted by testing the design solutions using questionnaires for System Usability Scale (SUS) and Net Promoter Score (NPS) evaluations.

3.5.1 First Iteration Evaluation Results

For the System Usability Scale (SUS) assessment, an average score of 82.72 out of 100 was obtained, as shown in Table 3. This score falls into the "Excellent" category with a grade of A, indicating an acceptable range at the acceptable level. This score is above the average System Usability Scale (SUS) score considered adequate, which is 68.

Table 3. System Usability Scale Results Iteration 1

Respondents	SUS Questions										SUS Score (Total * 2.5)
	1	2	3	4	5	6	7	8	9	10	
R1	5	1	5	2	5	1	5	1	4	1	95
R2	4	2	5	1	4	2	5	2	5	2	85
R3	4	3	3	2	4	2	4	2	3	3	65
R4	3	2	3	1	4	2	4	2	4	2	72.5
..R45	4	1	4	1	4	2	5	1	5	1	90
Average SUS											82.72

For the Net Promoter Score (NPS) assessment, a score of 55.56 out of 100 was obtained. There were 25 respondents (55.56%) categorized as Promoters, 20 respondents (44.44%) categorized as Neutrals or Passives, and 0 respondents (0%) categorized as Detractors. Here is an overview of the Net Promoter Score (NPS) calculation as depicted in Figure 10.

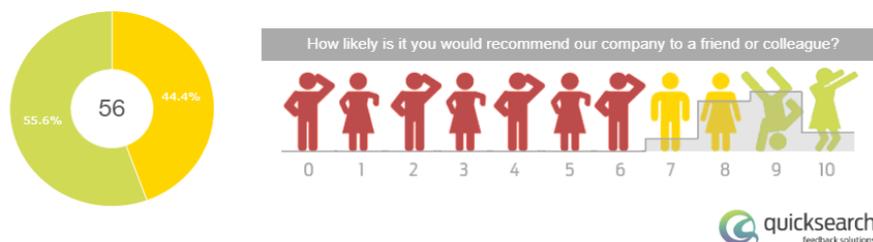


Figure 10. Net Promoter Score (NPS) Iteration 1 results

There is a suggested improvement from respondents regarding the Personal Notes page, where some suggested categorizing notes based on book titles, as shown in Figure 11.

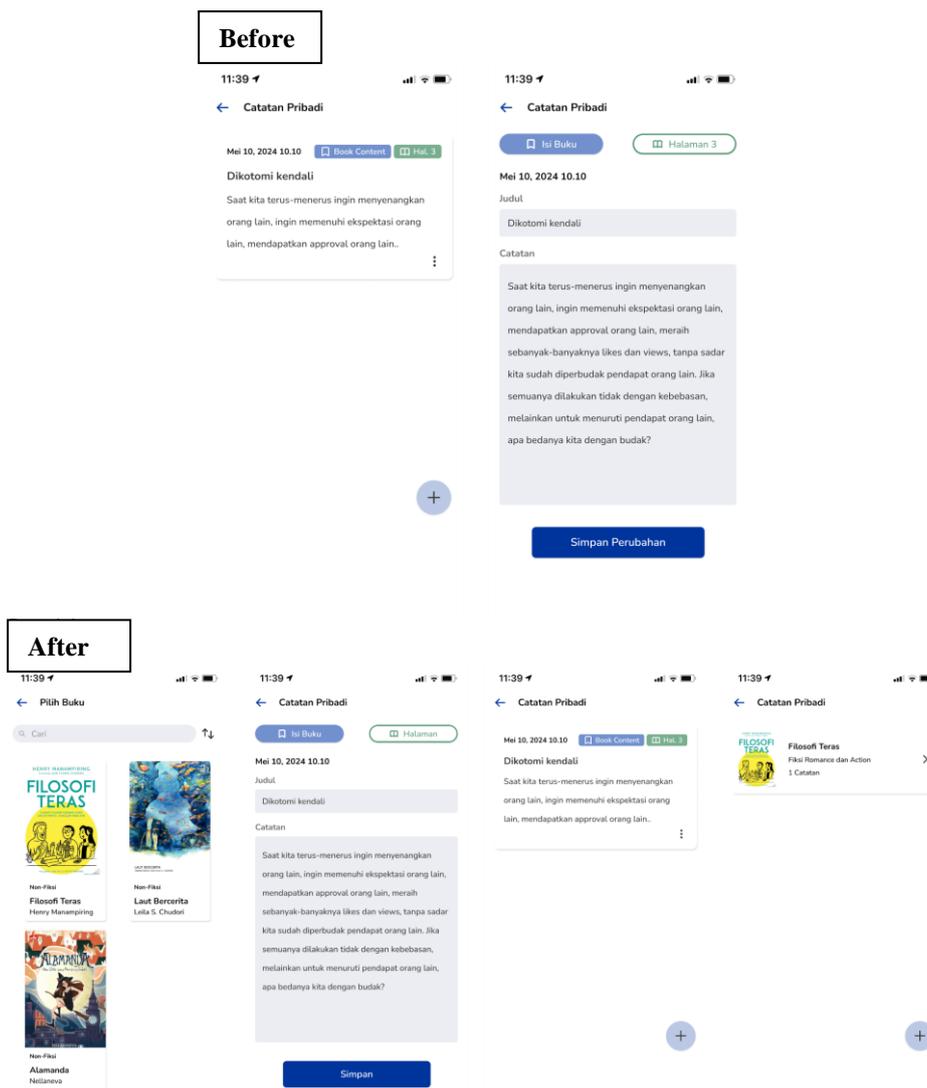


Figure 11. Design Improvements Iteration 1 Personal Note (Before - After)

3.5.2 Second Iteration Evaluation Results

For the System Usability Scale (SUS) assessment, an average score of 86.27 out of 100 was obtained, as shown in Table 4. This score falls into the "Excellent" category with a grade of A+, indicating an acceptable range at the acceptable level. This score is well above the average System Usability Scale (SUS) score considered adequate, which is 68.

Tabel 4. System Usability Scale Results Iteration 2

Respondents	SUS Questions										SUS Score (Total * 2.5)
	1	2	3	4	5	6	7	8	9	10	
R1	5	2	5	1	5	2	4	1	5	1	92.5
R2	5	1	5	2	5	2	5	1	5	2	92.5

Respondents	SUS Questions										SUS Score (Total * 2.5)
	1	2	3	4	5	6	7	8	9	10	
R3	5	2	5	1	5	2	5	2	5	1	92.5
R4	5	2	5	2	4	2	5	2	5	2	85
..R45	5	2	4	1	5	1	4	1	5	2	90
Average SUS											86.27

For the Net Promoter Score (NPS) assessment, a score of 73.33 out of 100 was obtained. There were 33 respondents (73.3%) categorized as Promoters, 12 respondents (26.7%) categorized as Neutrals or Passives, and 0 respondents (0%) categorized as Detractors. Here is an overview of the Net Promoter Score (NPS) calculation as depicted in Figure 12.

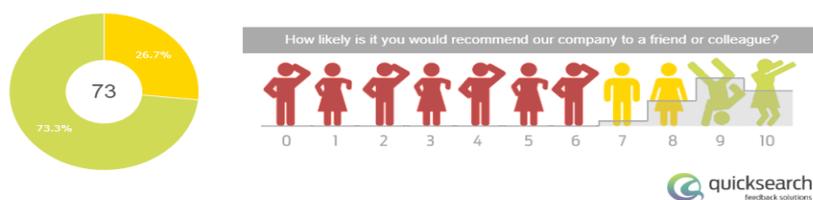


Figure 12. Net Promoter Score (NPS) Iteration 2 results

There is a suggested improvement from respondents regarding the Bookshelf page under the Loaned Books section, where some suggested using red text and background for books whose loan period is ending soon, as depicted in Figure 13.

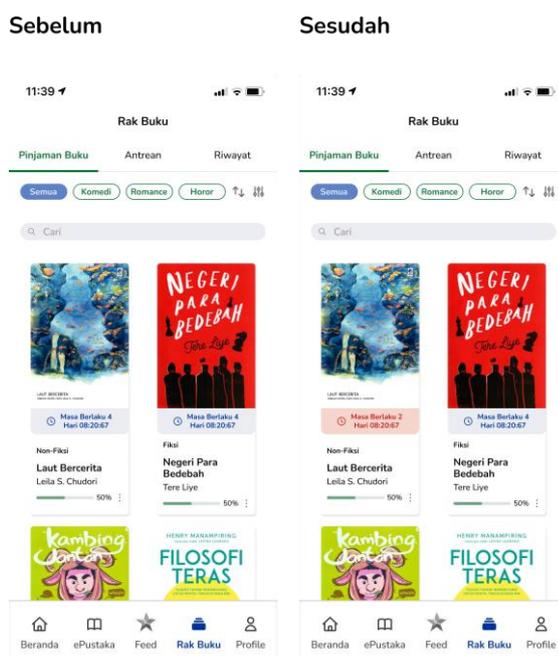


Figure 13. Book Loan Iteration 2 Design Improvements

4. CONCLUSIONS

Based on the research findings, it can be concluded that redesigning the UI/UX of the iPusnas application using the User-Centered Design method can enhance usability, ease of use, and user loyalty. Through the empathy phase, user pain points were identified, and user personas were created to represent users. Some users complained about the lack of reading trackers, book grouping, inconsistent interface, and other issues. After identifying all user needs and problems, design solutions were proposed and visualized through information architecture, wireframes, mockups, and interactive prototype simulations. The final stage involved testing the design outcomes to determine if they addressed user needs and issues. After two iterations, the first iteration resulted in a System Usability Scale (SUS) score of 82.72 out of 100 and a Net Promoter Score (NPS) of 55.56 out of 100. The second iteration achieved a System Usability Scale (SUS) score of 86.27 out of 100 and a Net Promoter Score (NPS) of 73.33 out of 100. Overall evaluation results showed improvement and met user needs effectively.

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