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Designing the UI/UX of a Mobile-Based Library Catalog Application for the XYZ Community Using the Design Thinking Method

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ABSTRACT

The XYZ Community library held over 800 book titles but managed its catalog entirely by hand, leaving members unable to confirm book availability or locate titles without an in-person visit. A preliminary survey of 30 members showed that most struggled to find desired books remotely, made unnecessary visits in the absence of a real-time catalog, and could not locate a book on the shelf even when present in the library. This study applied the Design Thinking method, across the stages of Empathize, Define, Ideate, Prototype, and Test, to design the user interface and user experience of a mobile library catalog application for XYZ Community members. Interviews and observations with twenty members and a survey of thirty members informed the design, which produced twelve priority features designed to address the identified pain points, including a real-time availability check for remote access, a category-filtered digital catalog for searching, and a shelf-location display for locating books in person. A high-fidelity prototype with six primary screens was built and evaluated for usability with thirty respondents, yielding a mean score of 82.7 out of 100, above the common acceptability threshold. A modest hesitation around the availability-check screen suggested one area for refinement before deployment.

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1. Introduction

The rapid advancement of information and communication technology has fundamentally transformed the way individuals access, discover, and consume information across every sector of society [1]. Libraries, traditionally conceived as physical repositories of books and documents, have evolved into dynamic digital knowledge hubs that offer members on-demand access to information regardless of temporal or spatial constraints [2]. This paradigmatic shift has placed community libraries at a crossroads: adapt to digital expectations or risk declining relevance among increasingly technology-proficient user populations.

Within the broader landscape of library digitalization, community libraries occupy a unique and underexplored position. Unlike institutional libraries affiliated with universities, schools, or government agencies, community libraries operate as grassroots knowledge-sharing initiatives driven by collective

volunteerism and shared literacy values [3]. The XYZ Community library in Purwokerto, Central Java, Indonesia, exemplifies this model an award-winning, literacy-centered community organization that has received national recognition including the Integrity Award from the Corruption Eradication Commission (KPK), the Satu Indonesia Award from Astra, and designation as an Inspiratif Community by the Ministry of Education, Culture, Research, and Technology (kemdiktisaintek). Despite maintaining a curated collection of over 800 book titles spanning science, technology, literature, history, and the arts, the library's discovery and borrowing system remains entirely manual, relying on handwritten register logs and physical notice boards to manage catalog information.

The consequences of this manual system are substantial. A preliminary survey of 30 community members revealed that 76,7% reported difficulty locating desired books without physically visiting the library. A further 80% indicated that the absence of a real-time digital catalog compelled them to make unnecessary visits, only to discover books were already borrowed. Additionally, 73,3% reported difficulty identifying the physical shelf location of a book even when present in the library. These findings collectively illustrate a significant gap between current library service delivery and contemporary user expectations shaped by pervasive digital experiences [4].

The high smartphone penetration rate among XYZ Community members 93,3% of survey respondents use Android smartphones as their primary device renders mobile application development a strategically appropriate solution. The mobile-first paradigm enables asynchronous access to catalog information, eliminating physical presence requirements and fundamentally redefining the user-library interaction model [4]. However, technical functionality alone is insufficient to ensure adoption; empirical research consistently demonstrates that user acceptance of mobile applications is predominantly governed by perceived usability, visual appeal, and the quality of the user experience (UX) and user interface (UI) [5].

Design Thinking, first systematized by IDEO and the Hasso-Plattner Institute of Design at Stanford University, provides a structured yet inherently iterative methodology for developing human-centered solutions to complex design problems [6]. Its five-stage framework Empathize, Define, Ideate, Prototype, and Test ensures that design decisions are continuously anchored in empirically derived user insights rather than designer assumptions [7]. The method's emphasis on empathy distinguishes it from traditional software development methodologies by mandating direct, contextual engagement with end users throughout the entire design lifecycle. A systematic literature review of Design Thinking in UI design confirmed that applications developed using this method consistently achieved higher usability scores compared to those developed through requirements-driven approaches [4].

The academic literature provides established precedents for applying Design Thinking to library application design. For instance, a comprehensive systematic review of mobile library applications identified usability and interface design as the two most critical determinants of user adoption across 89 reviewed studies. Addressing these critical factors, previous research [10] demonstrated that employing Design Thinking produced a library system prototype with measurably higher user acceptance compared to the incumbent system. Furthermore, other studies have successfully utilized Design Thinking to redesign the Rumah Baca Cerdas community reading room application, achieving positive usability outcomes. Similarly, the redesign of the iSolokKab [11] digital library application via this framework obtained strong user validation for its proposed prototype. Collectively, these studies affirm the methodological appropriateness and efficacy of Design Thinking for UI/UX initiatives within the library domain.

Nevertheless, a notable research gap persists in the application of Design Thinking specifically to informal community library settings. Existing studies predominantly focus on formal institutional libraries (university, school, or national library contexts), where user populations are relatively homogeneous and technically proficient. Informal community libraries, by contrast, serve heterogeneous user groups encompassing varying ages, educational backgrounds, and digital literacy levels conditions that introduce distinct design challenges not adequately addressed by prior literature [11]. This study addresses that gap by applying Design Thinking to the XYZ Community library, an informal grassroots organization, and generating empirically validated UI/UX design recommendations grounded in the community's unique social and cultural context.

The present study is further distinguished by its integration of a comprehensive Figma-based high-fidelity prototype encompassing six interconnected application screens, the development of a cohesive design system built around the XYZ Community's visual identity (primary green #3D6B35), and the largest usability evaluation sample (n=30) reported in comparable Indonesian community library application studies. Usability was measured using the System Usability Scale (SUS), a validated and widely adopted instrument whose psychometric properties and adjective-scale interpretations have been rigorously established [18][19].

This paper is structured as follows: Section 2 presents the Design Thinking research method; Section 3 reports results and discussion organized around each Design Thinking stage; Section 4 provides

conclusions and recommendations for future research. All prototype screens developed in this study are presented inline within the results section to facilitate direct evaluation of design decisions.

2. Research Method

This study is classified as applied research utilizing the Design Thinking methodology as the primary research and design framework, selected for its structured yet iterative approach to human-centered problem solving [6]. Originally developed at IDEO and formalized by the Hasso-Plattner Institute (d.school) at Stanford University, this framework encompasses five sequential yet iterative stages: Empathize, Define, Ideate, Prototype, and Test, each building upon the outputs of the preceding stage while allowing backward iteration when new insights emerge [7]. The research was conducted over five months (February - June 2026) at the XYZ Community in Purwokerto, Central Java, Indonesia. The research population comprised all active members of the XYZ Community, with samples selected purposively based on two criteria: borrowing frequency (minimum two loans per month) and digital literacy level (smartphone ownership and basic app usage proficiency). The structured research procedure, spanning the five operational stages of Design Thinking, is systematically outlined in Table 1.

Table 1 Structured Research Procedure of Design Thinking Stages

Stage	Method / Tool	Procedure	Output
1. Empathize	Interview, Observation, Questionnaire	Semi-structured interviews (n=20); 2-week observation; structured questionnaire (n=30)	Empathy map; user personas; pain point ranking
2. Define	PoV Framework; HMW Questions; User Journey Map	Synthesize empathy data into PoV statements; reframe as HMW questions; map user journey touchpoints	5 problem statements; HMW design brief; user journey map
3. Ideate	Crazy 8s; Mind Mapping; Impact-Effort Matrix	Participatory brainstorming with 5 co-designers; generate ideas; plot on Impact-Effort matrix; select Quick Wins and Strategic quadrants	12 priority features mapped to user pain points
4. Prototype	Paper Wireframe; Figma Hi-Fi Prototype	Lo-fi wireframe for rapid concept validation; hi-fi Figma prototype with design system (color, typography, grid); WCAG 2.1 AA contrast check [17]	6-screen hi-fi prototype; design system specification; IA diagram
5. Test	SUS Questionnaire; Think-Aloud Protocol; Task Scenarios	5 task scenarios (n=30); 10-item SUS questionnaire; concurrent think-aloud; score calculated via the standard SUS scoring formula [18]; interpreted via the adjective rating scale [19].	Mean SUS score; usability dimension breakdown; design iteration recommendations

2.1. Empathize

The Empathize stage constitutes the foundation of the Design Thinking process, requiring researchers to develop a deep, empathic understanding of users' lived experiences, motivations, and challenges within the library context [6]. Data collection employed three complementary instruments: (1) semi-structured interviews with 20 community members selected through purposive sampling based on borrowing frequency; (2) two-week direct observation of borrowing and catalog search activities; and (3) structured questionnaires distributed to 30 members to systematically map primary pain points. Synthesis artifacts included an empathy map and user personas representing three primary user segments.

2.2. Define

The Define stage transformed raw empathy data into actionable problem statements through systematic analysis using the Point of View (PoV) framework, which structures insights around user identity, user needs, and insight observations [7]. Problem statements were subsequently reframed as How Might We (HMW)

questions to catalyze constructive ideation. User journey mapping was additionally employed to chart comprehensive interaction touchpoints between users and library services. This stage produced five clearly articulated problem statements that served as the design brief for the Ideate stage.

2.3. Ideate

The Ideate stage employed two structured divergent thinking techniques: Crazy 8s rapid sketching and collaborative mind mapping, conducted in a two-hour session involving the research team and five community member co-designers [16]. The participatory co-design approach was deliberately adopted to ensure feature ideation was grounded in actual

community member perspectives and the five pain points identified in the Define stage, rather than researcher projections [11]. Features were evaluated using an Impact-Effort prioritization matrix, resulting in 12 high-priority features directly addressing the identified user needs.

2.4. Prototype

Prototyping proceeded through two fidelity iterations. The first iteration produced low-fidelity paper wireframes enabling rapid concept validation without technical investment. The second iteration produced a high-fidelity interactive prototype using Figma, comprising six primary application screens with full visual and interaction design specifications. The design system employed a primary green color (#3D6B35) derived from XYZ Community's existing visual identity materials, with the Inter typeface as the primary font family. Color contrast compliance was verified against WCAG 2.1 Level AA standards [17]. The information architecture was designed to ensure any content is reachable within three interactions from the home screen, adhering to the three-click usability heuristic [5].

2.5. Test

Usability evaluation was conducted in June 2026 involving 30 respondents the largest sample reported in comparable Indonesian community library application studies comprising active XYZ Community members aged 18-35 years (23 male, 7 female). Each respondent completed five standardized task scenarios covering all primary application screens. Quantitative measurement employed the 10-item System Usability Scale (SUS) questionnaire [18], with scores calculated using the standard SUS scoring formula and interpreted using the established adjective classification scale [19]. The SUS instrument uses a 5-point Likert response scale ranging from 1 (Strongly Disagree) to 5 (Strongly Agree), as detailed in Table 2.

Table 2 Questionnaire Scores

Answer	Score
Strongly Agree	1
Agree	2
Neutral	3
Disagree	4
Strongly Disagree	5

3. Result and Discussion

3.1. Empathize and Define Results

The empathy stage revealed that 73,3% of XYZ Community members were aged 18-35 years with an average library visit frequency of 2-3 times per month. Android smartphone ownership stood at 83,3% among respondents. Five primary pain points were identified and ranked by frequency of mention, as summarized in Table 3.

Table 3 Identified User Pain Points and Frequency

No.	Pain Point	Respondents
1	Cannot check book availability without visiting the library physically	90% (27/30)
2	No digital catalog for searching books remotely	83% (25/30)
3	Difficulty identifying physical shelf location of books	73% (22/30)
4	No easily accessible information on library operating hours	67% (20/30)
5	No clear guide to the book borrowing procedure	60% (18/30)

User persona analysis produced three representative profiles: (1) Andi, 22, student requires efficient search and DDC category filtering for academic references; (2) Rina, 28, young professional accesses the library after office hours and needs clear operational hours and WhatsApp contact; and (3) Budi, 35, general public needs to browse the catalog from home and locate books quickly upon arrival. The HMW questions

derived from these personas included: ‘How might we enable members to check book availability remotely?’, ‘How might we help users identify the physical shelf location of a book?’, and ‘How might we provide clear operating hours and borrowing procedures in the application?’

3.2. Ideate Results

The participatory brainstorming session produced feature ideas evaluated using an Impact-Effort prioritization matrix. Features mapped to the Quick Wins quadrant (high impact, low effort) and Strategic quadrant (high impact, high effort) were selected as priority features. Table 4 presents the 12 priority features selected based on the identified user pain points.

Table 4 Priority Functional Requirements of the Application

No.	Feature	Description	Priority
1	Splash Screen	Visual identity opening screen with logo and tagline	High
2	Onboarding	App feature introduction before accessing main content	High
3	Home (Beranda)	Featured book, popular categories, recommendations, new arrivals	High
4	DDC Catalog	Book list with DDC category filter and real-time status	High
5	Book Detail	Complete info: cover, ISBN, publisher, year, synopsis, shelf location	High
6	Availability Check	CTA button to verify real-time book availability	High
7	About Us	Community profile, 3-step borrowing procedure, operating hours	Medium
8	WhatsApp Contact	Direct access to community WhatsApp contact	Medium
9	Social Media	Link to official community Instagram account	Medium
10	Location Map	Map view of community secretariat	Medium
11	Book Search	Search by title or author across full catalog	High
12	Bottom Navigation	3-tab navigation: Home, Catalog, Information	High

3.3. Prototype Results - Design System

The high-fidelity prototype’s design system was built upon the XYZ Community’s existing visual identity, adopting primary green (#3D6B35) as the brand color. This selection aligns with color psychology research demonstrating that green evokes associations of growth, reliability, and environmental harmony attributes consonant with the community’s literacy-oriented mission [23]. The full design system specifications are presented in Table 5.

Table 5 Application Design System Specifications

Element	Specification	Application Context
Primary Color	#3D6B35 (Dark Green)	CTA buttons, available badge, active nav icon
Secondary Color	#6B9E5E (Medium Green)	Active category chips, progress indicators
Accent Color	#E8F5E2 (Light Green)	Card backgrounds, section highlights
Error / Closed	#E53935 (Red)	‘Borrowed’ badge, holiday closure notice
Background	#FFFFFF (White)	Primary background across all screens
Primary Typography	Inter Bold 24 32px	Page titles and book titles
Body Typography	Inter Regular 14 -16px	Descriptions, detail information
Caption Typography	Inter Regular 12px	Category labels, bibliographic metadata
Border Radius	12px cards / 24px buttons	Card components and CTA buttons
Icon System	Material Icons Outlined	Navigation, feature icons, actions
Navigation	3-Tab Bottom Navigation Bar	Home | Catalog | Information

Element	Specification	Application Context
Catalog Grid	2-Column, 12px gutter	Book list layout in Catalog screen
Contrast Ratio	7.2:1 (WCAG 2.1 AA ✓)	Primary color (#3D6B35) vs white

3.4. Prototype Results - Screen Descriptions

3.4.1 Splash Screen

The Splash Screen constitutes the application's first visual touchpoint, presenting the XYZ Community brand identity through a centered logo (open book icon on rounded dark-green background), application name 'Komunitas XYZ' in bold typography, and the tagline 'Gerbang Pengetahuan & Koneksi.' A loading progress indicator with the label 'AKSES KATALOG PUBLIK' at the base of the screen communicates application initialization status. The screen employs a clean white-to-light-grey gradient background to project a minimalist and professional aesthetic consistent with contemporary mobile application standards [5].



Figure 1 Splash Screen

3.4.2 Onboarding Screen

The Onboarding Screen serves as the primary value communication mechanism, contextualizing the application's purpose for first-time users. A full-bleed warm library illustration occupies the upper portion of the screen, establishing an emotional connection with the library context [12]. The primary headline 'Jelajahi ribuan koleksi buku favorit komunitasmu di sini' communicates the application's core value proposition in direct and accessible language. Three check-marked feature highlights (Katalog Digital, Update Harian, Reservasi Cepat) succinctly enumerate the application's key capabilities. A prominently placed green CTA button labeled 'Mulai Jelajahi' directs users to the main application content.



Figure 2 Onboarding Screen

3.4.3 Home Screen (Beranda)

The Home Screen organizes content into four hierarchical sections optimized for rapid information discovery. The hero banner prominently features 'Laut Bercerita' by Leila S. Chudori as the featured book of the month, leveraging social proof to drive engagement with popular content. Below the banner, horizontally scrollable category chips (Fiction, Non-Fiction, Children's, and additional categories) provide rapid genre-based navigation. The 'Buku Rekomendasi' section presents algorithmically curated book recommendations in a horizontally scrollable card grid. The 'Koleksi Terbaru' section displays recent additions in a compact vertical list format with color-coded availability badges green for available and grey for borrowed enabling instant status assessment without navigating to individual book pages [13].

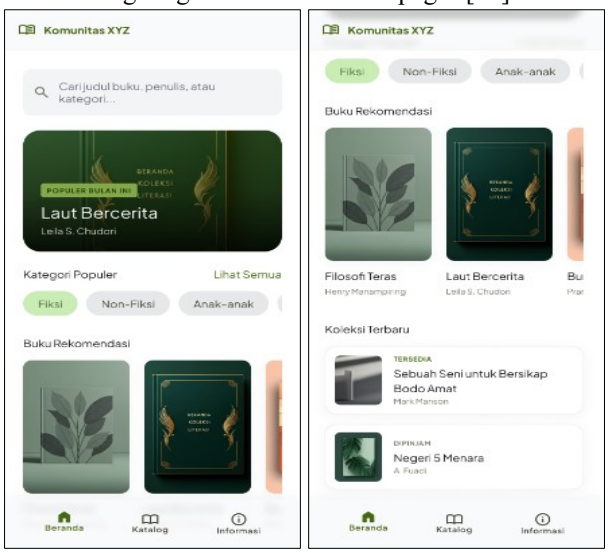


Figure 3 Home Screen (Beranda)

3.4.4 Catalog Screen

The Catalog Screen implements a two-column grid layout with DDC (Dewey Decimal Classification) category chips as the primary filtering mechanism. The search bar at the top of the screen supports both title and author queries, addressing the most frequently cited pain point inability to search the catalog remotely. DDC category chips include 000 Karya Umum (General Works), 100 Filsafat (Philosophy), 200 Agama (Religion), and additional standard classifications, making the familiar library classification system accessible to non-specialist users through descriptive labels [15]. Each book card displays a cover thumbnail, title, author name, and availability badge. The visual distinction between available (green badge) and borrowed (grey badge) books provides immediate visual feedback, reducing cognitive load during catalog browsing [8].

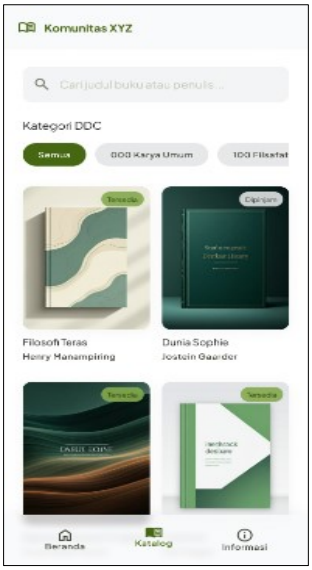


Figure 4 Catalog Screen

3.4.5 Book Detail Screen

The Book Detail Screen presents comprehensive bibliographic and location information for selected books. The 'Filosofi Teras' by Henry Manampiring is illustrated as an exemplar. A large-format cover image with an availability badge at the top right immediately communicates borrowing status. Genre tags (Non-Fiction, Stoicism, Self-Improvement) below the title provide categorical context without requiring user navigation. The bibliographic grid presents ISBN (9786024125189), publisher (Buku Kompas), publication year (2019), page count (320 pages), language (Indonesian), and category (Self-Development) in a clean two-column layout. A dedicated 'Informasi Lokasi' card a feature specifically designed in response to the pain point of difficulty identifying physical shelf location directs users to 'Rak B12-Lantai 2.' The fixed 'Cek Ketersediaan' CTA button at the screen bottom provides a direct action path from discovery to borrowing initiation [10].

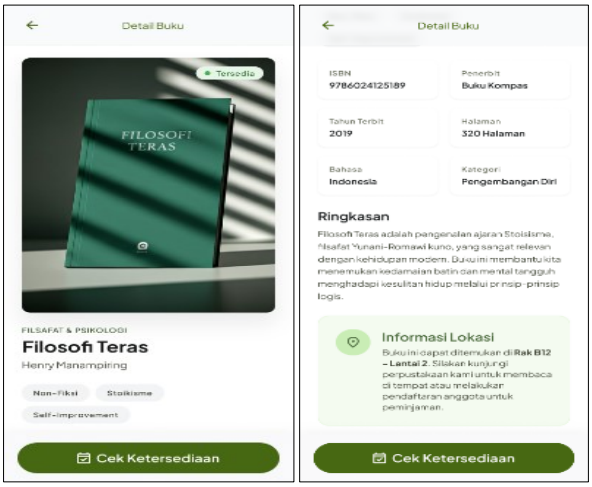


Figure 5 Book Detail Screen

3.4.6 About Us Screen (Informasi)

The About Us Screen consolidates all operational and institutional information required by community members into a single navigable screen. A photographic banner of the library space with overlaid 'Tentang Kami' title establishes visual context. The community description communicates the XYZ Community's mission as a literacy-centered institution. The 'Prosedur Peminjaman Luring' section presents a three-step numbered guide: (1) search the digital catalog; (2) visit the XYZ Community Secretariat; (3) register borrowing with administrative staff directly addressing the procedural uncertainty identified in the Empathize stage. The 'Jam Operasional' section presents structured operating hours with clear visual differentiation between regular hours (Monday-Friday 09:00-17:00; Saturday 10:00-15:00) and a red-badge notification indicating closure on Sundays and public holidays. Contact information is provided through tappable rows for WhatsApp and Instagram, enabling one-tap access to community support channels [13].

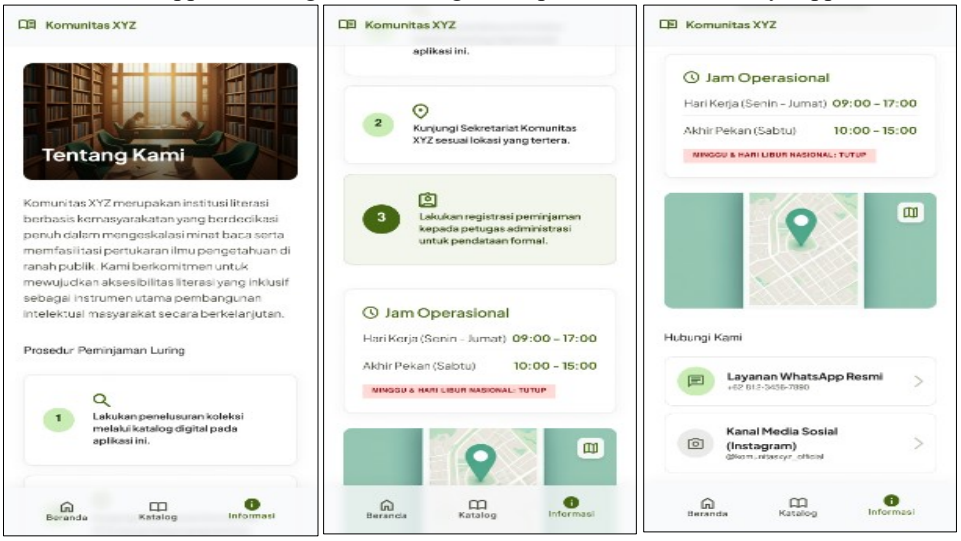


Figure 6 About Us Screen (Informasi)

3.5. Usability Evaluation Results

Usability testing was conducted with 30 respondents, all active XYZ Community members aged 18-35 years (23 male, 7 female). All 30 respondents successfully completed all five task scenarios without assistance. Task completion times ranged from 4,2 to 8,7 minutes. Table 6 presents individual SUS scores for all 30 respondents.

Table 6 SUS Score per Respondent (n=30)

Resp.	Score	Resp.	Score	Resp.	Score
R-01	82,5	R-11	80,0	R-21	90,0
R-02	85,0	R-12	85,0	R-22	82,5
R-03	80,0	R-13	87,5	R-23	77,5
R-04	87,5	R-14	82,5	R-24	85,0
R-05	77,5	R-15	75,0	R-25	80,0
R-06	85,0	R-16	80,0	R-26	87,5
R-07	82,5	R-17	87,5	R-27	82,5
R-08	90,0	R-18	82,5	R-28	75,0
R-09	75,0	R-19	85,0	R-29	85,0
R-10	85,0	R-20	77,5	R-30	82,5
		Mean Score			82,7

The mean SUS score of 82,7 falls within the Excellent category (Grade B) according to the adjective-scale classification [19], which requires a minimum score of 80,3 for this designation. This result exceeds the widely cited acceptability threshold of 70 by a margin of 12,7 points [18].

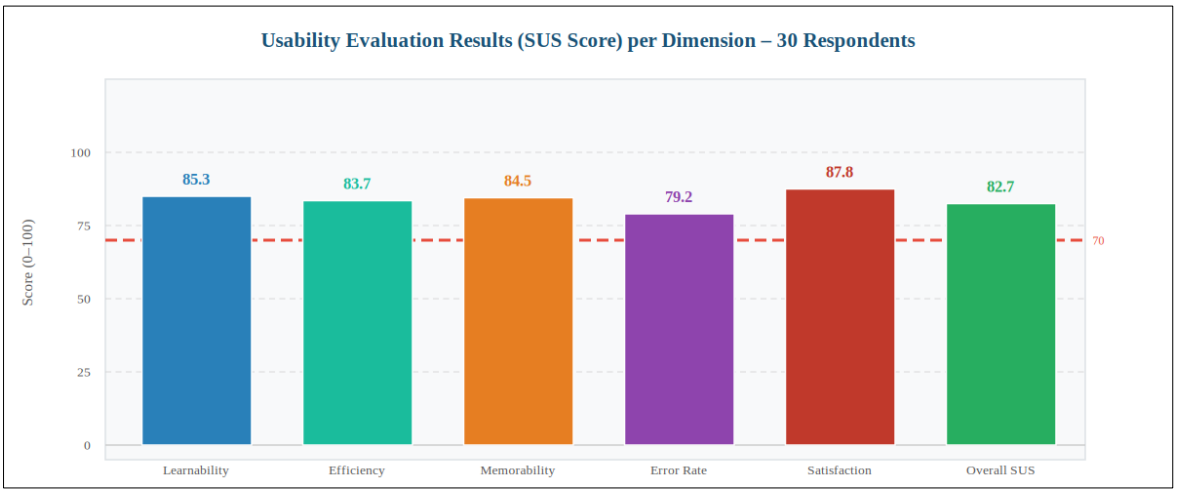


Figure 7 SUS Score by Dimension-30 Respondents (Mean = 82,7)

The satisfaction dimension obtained the highest score (87,8), corroborated by think-aloud protocol data documenting consistent positive responses to the three-tab navigation clarity, color-coded availability badges, and the shelf location card on the Book Detail screen. Respondents specifically praised the visual coherence of the green color system and the intuitiveness of the bottom navigation bar, aligning with prior findings [13] that consistent visual design languages significantly enhance user satisfaction in library digital applications.

The error rate dimension recorded the lowest score (79,2), attributable to momentary hesitation observed in six respondents (20%) at the 'Cek Ketersediaan' button users initially expected to see availability status directly on the catalog screen rather than navigating to a detail page. This finding has been incorporated as a design iteration recommendation: adding a persistent availability badge overlay on catalog grid cards, and supplementing the Book Detail CTA button with a brief contextual tooltip. Similarly, prior research [25] identified analogous navigation ambiguity in the iPusnas redesign, advocating for progressive disclosure mechanisms as an effective mitigation strategy.

Comparative analysis positions this study's SUS score of 82,7 favorably within the extant literature. A previous study reported a Single Ease Question (SEQ) average of 6,5-7,0 for a comparable library system prototype developed via Design Thinking [10], while another initiative achieved positive yet unspecified usability outcomes for the Rumah Baca Cerdas library mobile application redesign [11]. The enlarged sample size of 30 respondents in this study compared to the 15-respondent samples prevalent in comparable studies [10][13] provides substantially greater statistical confidence in the reported outcomes and reduces the risk of sampling bias that may affect smaller usability studies [19].

The participatory co-design approach adopted during the Ideate stage involving five community members as active co-designers alongside the research team is posited as a primary contributor to the elevated usability scores. Co-design ensures that feature prioritization reflects genuine community needs rather than researcher projections, producing interfaces that resonate more authentically with target users [11]. The systematic review conducted by [4] identified co-design as one of the three most significant predictors of usability outcomes in Design Thinking UI studies, alongside prototype fidelity and the representativeness of the test sample.

The integration of WCAG 2.1 Level AA accessibility compliance (contrast ratio 7,2:1) represents a methodological contribution absent from most comparable Indonesian library application studies. This compliance ensures the application remains usable for community members with visual impairments, directly advancing the XYZ Community's inclusive literacy mission [17]. The Material Icons Outlined icon system provides a standardized, culturally neutral visual vocabulary that supports cross-generational usability particularly important for the community's diverse membership spanning ages 18 to 50+ [5].

4. Conclusion

This study successfully designed a mobile-based library catalog application UI/UX for the XYZ Community using the Design Thinking method across five iterative stages: Empathize, Define, Ideate, Prototype, and Test. The Empathize stage identified five primary user pain points remote availability checking, absence of a digital catalog, difficulty locating physical shelf positions, inaccessible operating hours information, and unclear borrowing procedures that served as the empirical foundation for all subsequent design decisions. The Ideate stage, conducted as a participatory co-design session with community member co-designers, produced 12 high-impact priority features directly derived from the five identified user pain points. The resulting high-fidelity Figma prototype comprises six interconnected screens (Splash Screen, Onboarding, Home, Catalog, Book Detail, and About Us) underpinned by a cohesive green-themed design system (#3D6B35) and verified WCAG 2.1 AA accessibility compliance [17]. System Usability Scale (SUS) evaluation with 30 respondents yielded a mean score of 82,7, classified as Excellent (Grade B), confirming high usability and user acceptance. The prototype is deemed implementation-ready and is recommended for development using React Native or Flutter to support cross-platform Android and iOS deployment. Future research should incorporate functional application development, integration of online borrowing and notification features, longitudinal usability studies post-deployment, and expanded accessibility testing with elderly and visually impaired community members.

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