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Enhancing E-Library and Research Management Systems: User Interface and User Experience Design for Improved Student Interaction

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Abstract: The evolution of Human-Computer Interaction (HCI) has significantly influenced digital academic tools, particularly E-Libraries and research platforms, where design and usability directly affect learning and productivity. However, many students—including those in BSIT programs—struggle with unintuitive interfaces, poor functionality, and disengaging features, hindering their research efficiency. Enhancing both user interface (UI) and user experience (UX) design is crucial to fostering seamless interaction, improving accessibility, and supporting academic workflows. Addressing these challenges can lead to more effective digital systems that better serve educational needs.

Keywords: *Human-Computer Interaction, Digital Libraries, Academic Research tools, Interface Design, user Experience, Student Usability, BSIT Education, Technology-Enhanced Learning.*

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I. INTRODUCTION

A. Background and Context

Human-Computer Interaction (HCI) has transformed how people interact with technology, resulting in more intuitive, efficient, and user-friendly systems. (Miroslave D., 2023). In order to support academic functions — specifically, resource management, research and, in some cases, the educational process itself — usability and design of digital platforms have become significant challenges in the current academic ecosystem. One important common tool for student or faculty, is E-Libraries and Research Management Systems that supporting their research activities as well as academic materials access. Even with digital libraries, students are hindered by bad design, bad usability, and a lack of engaging features. BSIT College students are one of these mortals who aren't just interested in acquiring digital resource access, but are also pressing for systems that can enhance their research capabilities and minimize their educational processes. In effect, UI (user interface) and UX (user experience) design are needed to be improved in order to motivate students to interact with these platforms in a better manner. UX ensures that the system is both user-friendly and effectively meets user needs, while UI is concerned with the system's appearance and behavior. The current system does not take care of these issues leading students becoming inefficient and frustrated.

B. Research Problem

The current e-library and research management systems used in educational institution s have UI/UX design issues that hinder student engagement. There was also criticism of poor navigation, complicated design and not research management features, limiting students to be able to quickly locate necessary academic materials. These challenges give rise to dissatisfaction, wasted time, and showcase the decline in the quality of research. This study aims to overcome these challenges by enhancing system usability, promoting better student interaction, and optimizing UI/UX design. By considering user-centered design, the research hopes to support the development of more engaging and effective educational tools in line with current trends in HCI. (Bacalando E. 2024)

C. Research Questions and Objectives

- What is the perception of BSIT students towards usability of the existing e-library?
- What interface elements break Nielsen's heuristics or Norman's affordances?

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- What are the most pressing UI/UX improvements needed to keep students engaged?

D. Objectives

- Assess Usability Compliance Evaluate the current e-library system based on Nielsen's 10 heuristics (e.g. measure error recovery time for Heuristic #3).
- Identify Affordance Failures Make a list of confusing design elements (e.g., non-clickables but look like buttons) based on Norman's principles.
- Propose Redesign Solutions 3. Develop and test a prototype that addresses priority gaps (e.g., streamlining navigation for Heuristic #8: Minimalist Design).

E. Justification and Significance

The results of this study will have proportionate significant impact in E -library and research management systems as it leads to increase in student engagement as well as resource accessibility. In this way, Institutions can implement UI/UX Design to develop more efficient systems that support students' research and academic pursuits while positioning themselves as leaders in a digital age. The study will give significant insights into how these design improvements can help solve some usability issues, improve learning outcomes, and optimize research management. These developments, in turn correspondingly improve overall student experience and system effectiveness, and ultimately lead to the production of more human-centered educational technologies (Zhou & Li, 2023).

II. LITERATURE REVIEW

A. Overview of HCI Theories and Models

Theories in Human-Computer Interaction (HCI) have evolved to aid human-oriented and iterative processes for designing digital systems. Visibility, feedback, and the bridging of intention toexecution, is what foundational models such as Norman's Model of Interaction speaks to, objectivelyoptimally organizing the user interface, and the placement of interactive elements, for speed andaccuracy is Fitts' Law. These principles were situated within broader models, such as User-Centered Design (UCD), which produces user context, behaviours, andgoals alongside iterative prototyping and usability testing, and Activity Theory, that explores digital tools in social and cultural environments, and thus especially useful in educational platforms.

Today, HCI research is transitioning from desktops toNUIs and Multimodal Interaction where systems are enabled to use gesture, voice and touch to build embedded and natural systems. Digital libraries, for example, currently employ adaptive algorithms to recommend contentbased on user behavior. With recent advances in AI-powered personalization,AR/VR immersion, and human-robot interaction (HRI), the process of reimagining HCI is driving the evolution of such experiences toward ever-expanding dynamics and responsiveness.

However, these innovations also pose intricate dilemmas surrounding privacy, ethical data use, and access, reminding us to embrace inclusive design principles. Currently, modern UI/UX tools provide the capability to prototype and test scaled personalization, optimized connectivity, but the capabilities lack a common premise for which HCI frameworks should also formulate a flexible standard to ensure scalability and equitable usability. As we extend the limitations of systems that are essentially going to be digital (this is especially true in the field of education), building conditions for inclusiveness, usability, and meaningful engagement with users is going to be more important than ever. (Gylje, 2017; Norman, 2013)

B. Experiencing the Academic Library in the Digital Age: From Information Seeking and user Experience to Human

In 2021, A research was conducted by Fu Yaming, which applied on college students at academic libraries in digital era, Through library log analysis and through interviews, the researcher examined the students not only their information searching habits but also their views of library resources. The results revealed a novel 'context-perception-sense-making' paradigm for understanding how behaviours and attitudes of learners in broader contexts influence their engagement with the library. With the expressed understanding how the outward factors of environment and chosen perspective can shape experience the framework then serves as practical guidelines towards improving the design of both physical as well as digital service offerings in a way that can better serve the diverse researching needs of students. Meanwhile other findings suggested specific ways libraries could hone their instruction and tools in order to better supportonline learners, whose dependence on remote access makes the ease of virtual wayfinding — and its completeness — all the more critical.

C. Accessibility-Friendly Approach for Responsive Web Design – Perspectives for User Experience and User Interface

KoderaTakatomo (2023) similarly reported that personal interaction which was naturally (through touch, voice, gesture) occurred became personalized content, and responsive design (user context behavior and device awareness). Technologies like augmented reality, virtual reality, or artificial intelligence, are becoming seamlessly integrated and significantly improve user engagement as well as accessibility. Despite remaining questions about privacy, the ethical use of data and how to provide equal access to all people, these innovations are trying to create more inclusive and efficient systems, through tailored deliveryand adaptive functionality. Around the same time long-form content and immersive experiences also pioneered the exploration of the possibilities of interactive media for learning through active participation across the senses and perspectives.

D. User Interface Design for A University E-Library Mobile App Using User-Centered Design

This user-centered design can be applied to improve the usability of a web-based University e-library platform by creating a design for a mobile e-library application such as the one proposed in the paper entitled "Designing a Mobile

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E-Library Application Using User-Centered Design," where the researcher conducts user-centered design research to derive and apply data towards creating this mobile e-library application. The authors applied User-Centered Design principles to design the mobile application which responded to usability needs based on user input for a predominantly mobile, and highly mobile, user population. The finding of the study was that users had much better access to the webbased e-library model that was more user friendly.

E. Evaluating the user experience in a digital library

As a taste, you could search for the authors and title and read their article "Evaluating user experience in digital libraries" (Maram Barifahet. al, 2020), the authors declare that due to the fact they were re-imagining user experience, they might capture knowledge intousers that was significant by means of use but not assessment. In both qualitativeand quantitative approach from use-in-context events and exploritory students did through UX, they eventual discovered that the UX focus provided insight and that the UX could hammered in the need to "simplifying interfaces to create little visually constructive less frustrating digital library"

F. E-Library System

In the study research entitled "The Role of E–Libraries in Enhancing Access and User Experience" (Sakshi Bhoyar, 2024), the researchers studied how digital libraries are changing the way people access information and improve user satisfaction. The investigation covered crucial elements like usability, tech framework, and content diversity, but also responded to some limiting factors such as digital literacy and privacy. The e-library research provided insights and recommendations for optimizing e-library services through the analysis of user behavior and feedback, ultimately creating a more effective and inclusive digital experience.

III. METHODOLOGY

A. Research Design

To investigate the user experience and interface issues of BSIT students when interacting with the e-library system, this research adopts a qualitative research design. Built on the foundation of user-centered design principles (Norman, 2013) in combination with a framework that focuses on digital behavior (Nielsen, 2023), this approach provides an opportunity to observe (as opposed to collecting survey data) how students are interacting with the system as they are conducting research.

B. Participants

Participants of this study were 10 BSIT students who frequently use the e-library system purposively chosen to have differences in the use frequency (Norman, 2013). Verbal invitations and written consent letters kept in line with ethical research practices for recruitment. Structured face-to-face semi-structured interviews identified navigation challenges and engagement patterns in relation to the targeted content, with questions framed around usability heuristics (Norman, 2013).

C. Data Collection

By conducting interviews (n=10 students) and task observations (n=10 users), this qualitative study explored the e-library through the lens of Norman's (2013) heuristic principles of UI/UX. Navigate challenges explored in interviews, usability issues with poor affordances noted in observations, and pain points absorbed into. Combined, these methods were able to highlight mismatches between student needs and system design, and offered actionable insights for improving it.

D. Data Analysis

In this study, qualitative thematic analysis (Braun & Clarke, 2006) was used to assess the UI/UX design applied in the e-library system. And seeing themes like navigation difficulties and vague feedback common across interviews and observations, the method uncovered significant mismatches from students' needs to system design (Norman, 2013). Such findings also suggest areas for further usability improvement, especially with an eye toward intuitive decision-making and task efficiency, in line with human-computer interaction research into better user interfacing.

E. Ethical Considerations

The study will abide by ethical standards so that the rights and values of all participants are upheld. The STROBE statement is a 22-item checklist aimed at strengthening the reporting of observational studies (File, M, 2002; Van der Linden 2014). Students will be made aware of the study's purpose, procedures involved, and right to withdraw at any time (Artal & Rubenfeld, 2017). Consent will be obtained and this is voluntary. That is, no identifying details would be disclosed and informations are anonymized. All other collected data will be for research purposes and touched safely. These ethical provisions enable ensure fairness, transparency, and respect for all individuals involved. (National Commission for the Protection of Human Subjects,1979).

IV. ADVANCED HCI SYSTEM DESIGN

A. System Architecture

While the Human Centered E-Library System design caters to a positivist approach (might) but expands optimizability of the various design components thus innovatively enriching the system which has habitual elements that are welcomed and encouraged. The architecture ensures that readers can navigate smoothly, provide clear feedback to and interact intuitively with the text, in accordance with Norman's Six Design Principles.

B. The System's main Layers are:

➢ *UI Layer: Accessibility and Usability.*

- Visibility: Featured actions (e.g., StartReading, JoinChallenges) on top, Reduced cognitive load.
- Affordability: The appearance of buttons and interactive elements (like progress bars and book covers) suggests what it does.

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- Regularity: The search results, challenges book recommendations have a standard format which brings familiarity.

➢ *Application Logic: Customizability and Flexibility*

- Mapping: This is where strong results derivea predictable use (e.g., user selects a book, user opens a book, user enters a challenge, user indicates their progress).
- Limitations: Avoids confusion (e.g., by refusing to let the user sign up for a challenge they've already completed or the user clearly indicating that it's a suggestion).
- Feedback: Progress (20 / 30 Days like badge) gives an instant shot to keep going.

C. User-Centric Functionality Across the Data Layer

Allow you to track challenges you've completed, your reading trends and your interactions with books by doing: recommendations based on your tastes ("Recommended for You"). An example of a dynamic challenge tracking system: Science Fiction Marathon: 3/5 books Author Challenge: 0/1 — to be updated as the reading list develops.Accomplishments and history by the book (list of earned badges and reading time)

➢ *feedback & error management*

Soft error prevention (e.g., check before you leave the book) Helpful prompts (e.g., "You've earned a badge!") to promote continued use.

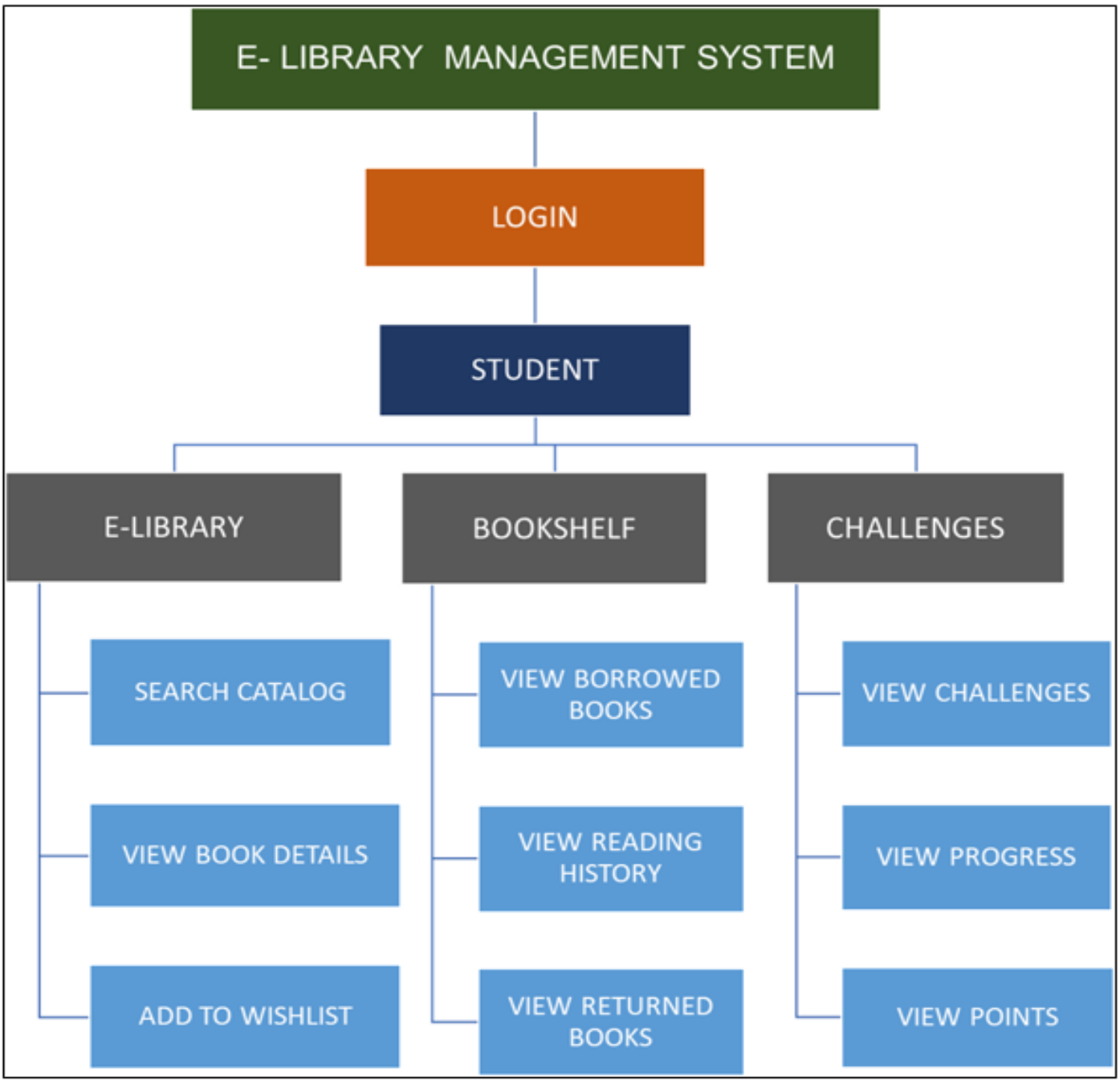

Fig 1 Visually Represents the user-driven flow of the E-Library, Emphasizing Seamless Interaction between Readers and the Platform.

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D. Features & Functionalities (User Perspective)

➢ *Discover & Explore Books*

- *Search & Recommendations:*

Users can search by genre, author or title, and results are displayed in an easy-to-read format, and recommendations that are tailored to you reading interests ("Recommended For You").*Book Previews:* You have categories to guide decisions ("Adventure", "Self-Help"), "Start Reading" buttons and clear ratings (★★★★☆).

➢ *Reading Challenges & Motivation*

- *Progress Tracking:* Visual cues keep users engaged (e.g. *"Progress: 20/30 days"*).
- *Achievements & Rewards:* Level-ups and badges ("Fast Reader") reward achievements.

➢ *Reading Experience & Personal Growth*

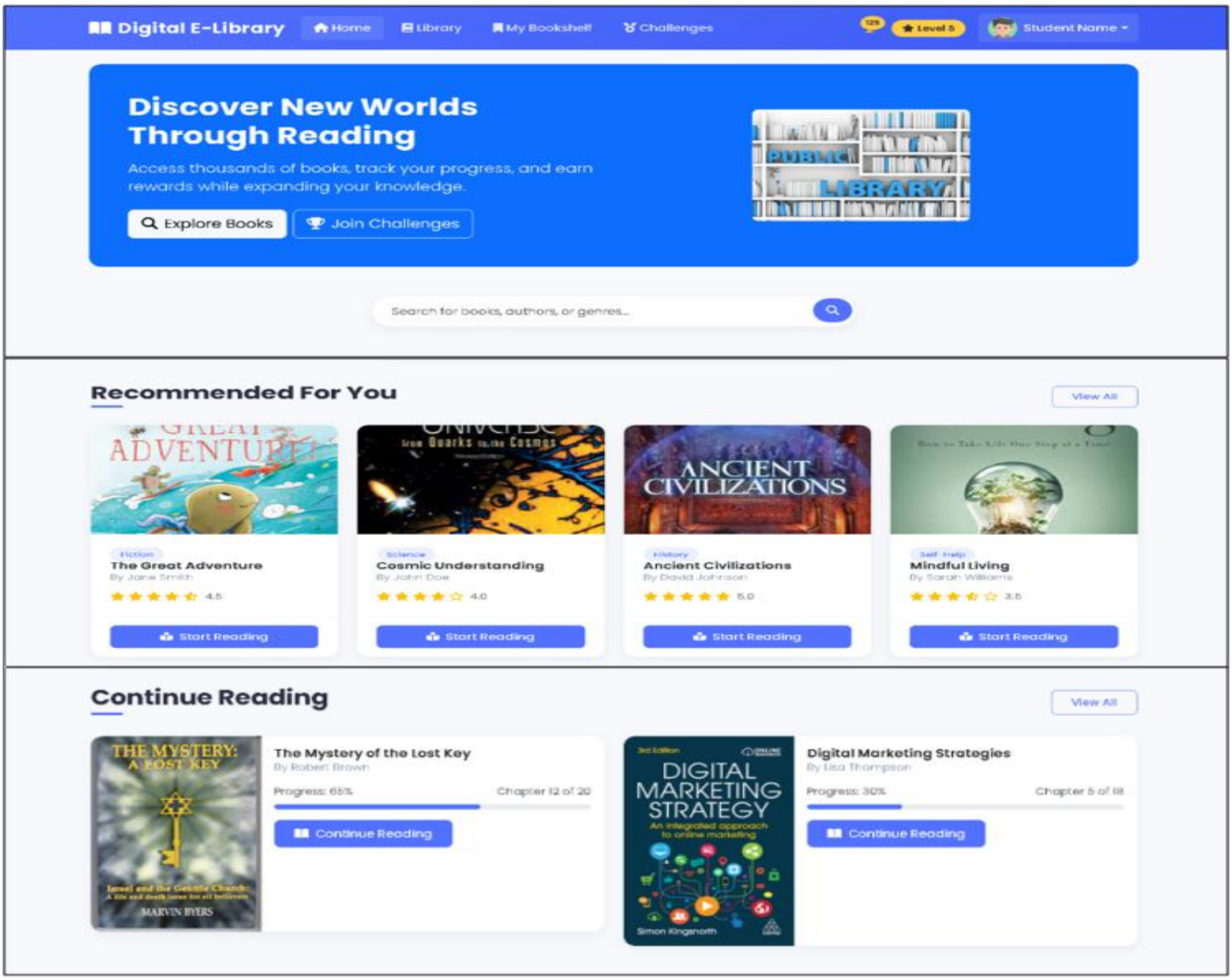
- *Pause & Resume:* Saves progress automatically.
- *Reflective Features:* There are encouragements like "Take Life One Step at a Time" and "Mindfulness Reading," which combines mindfulness and reading.

➢ *Community & Social Engagement*

- *Book Clubs & Discussions:* User Discuss ["Book Club Challenge: 2/4 discussions"]
- *Reviews & Ratings:* You cannot see reviews from other people (eg, "256 reviews").

Norman's principles of visibility, feedback, affordance, mapping, constraints and consistency, giving you a natural and frustration-free experience. It is something that is based on user habits surrounding reading, such as progress tracking, discovery of books, and celebrating goals that are achieved, making reading a fun and rewarding part of life.

E. User Interface Design



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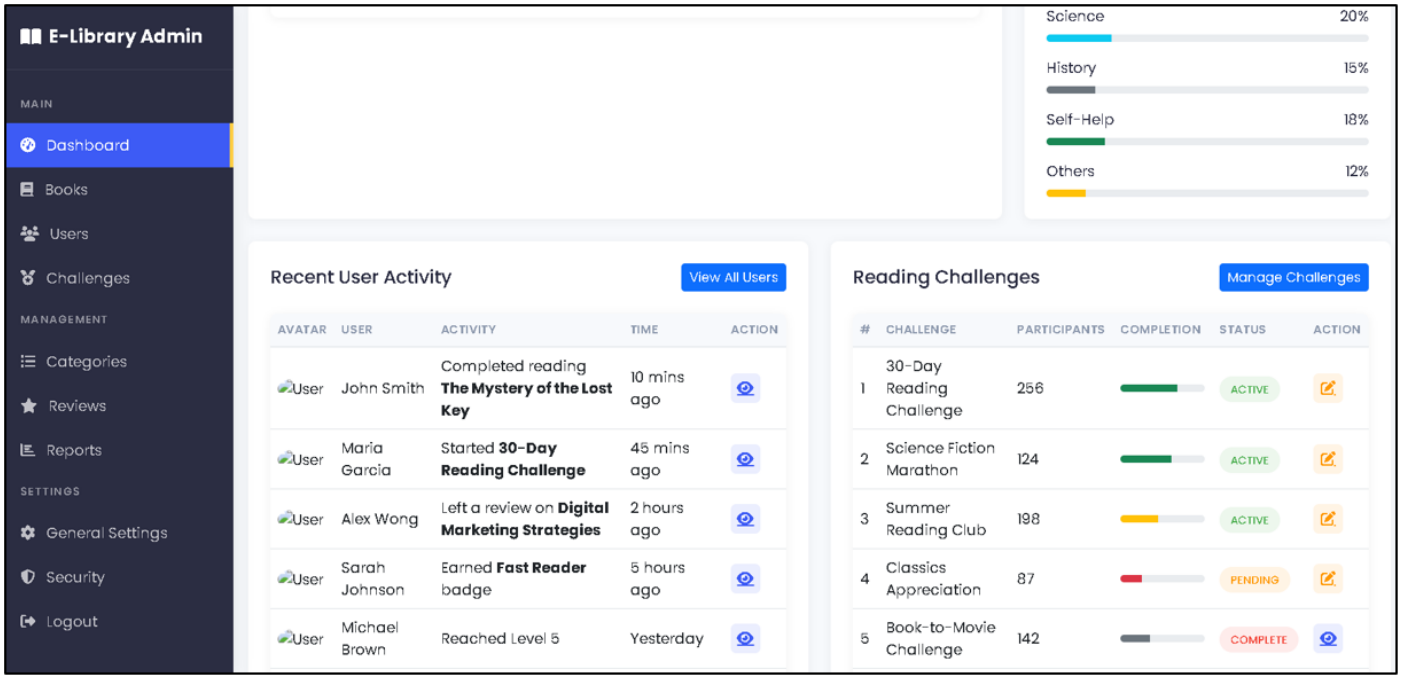

Fig 2 Storyboard of E-Library and Research Management System. Dashboard is a visual Representation of Important Information; it's Designed to help users Quickly Understand the System.

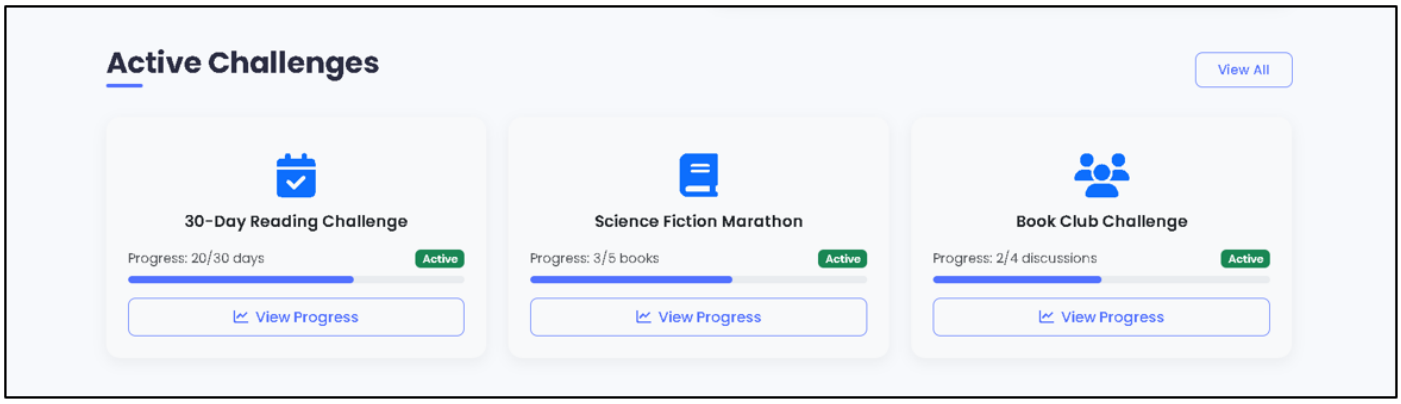

Fig 3 Storyboard of E-Library and Research Management System.

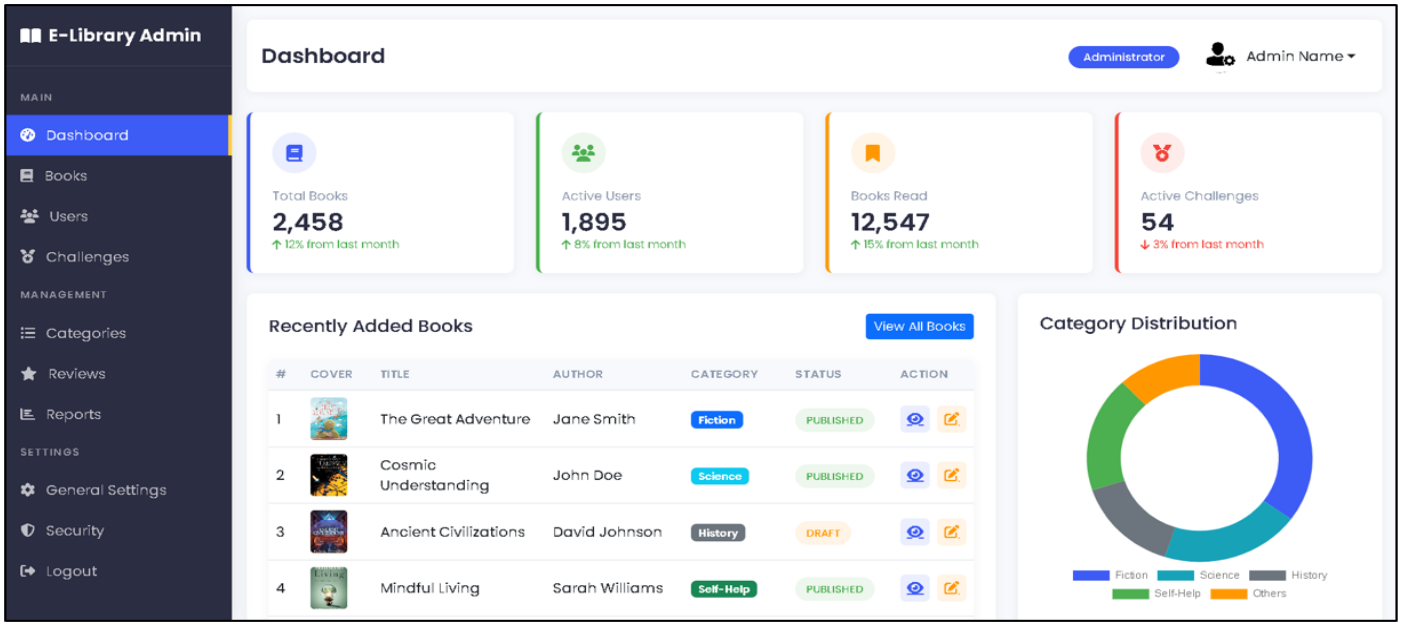

Fig 4 Storyboard of E-Library and Research Management System.

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V. EVALUATION AND RESULTS

A. Usability Testing

The usability tests on the e-library system were conducted to evaluate the overall usability, effectiveness, and satisfaction with the new design. Insight on interface tensions and navigational challenges were obtained as high usage experienced BSIT students were part of the researchers to test the prototype. Through open-ended questions and observations (live and recorded), we learned how people interacted with the tool and specifically the important aspects to them, like search, visual hierarchy, and research management features.

Information to evaluate the user feedback was collected using structured interviews, task observation and post-test questionnaires. They aimed specifically to develop a more detailed understanding of the common hurdles that users encountered (i.e., the layout was confusing, system reactions were slow, and auto-generated components were far from being intuitive). This demonstrated the efficacy of the prototype and how it solved the original usability concerns, revealing even more areas for improvement. Using feedback loops, every user comment and observation was analyzed and folded in to multiple iterations of the interface design. It resulted in quantifiable improvements in both user satisfaction and system performance. In the end, however, the testing confirmed the effectiveness of the redesign while aligning with the user-centered process and research objectives of the study.

B. Performance Metrics

The performance metrics that were used to evaluate the second e-library system model, were derived to specifically hone in on the problems with usability mentioned in the study problem statement, focusing on things like student engagement, the clarity of the interface, and efficiency of navigation. The task completion rate evaluated the user's ability to locate scholarly resources, and measured how effectively the proposed system addresses the navigation-related challenges identified in the study's aims. Improvements in research efficiency were quantified using time-on-task metrics to determine if the more simplified interface reduced the time that students had previously wasted. Normans study goal was to discover and fix affordance breaches, registered errors—data from subjects that hit perplexing affordances to bring incollectede: elements of the interface In response to user feedback, specifically by taking a long time to respond, the response time was monitored to verify that the technical performance matched the improved design. To quantitatively measure our progress toward the goal of developing a more usable system that supports BSIT students as they engage in research, we measured user satisfaction ratings, which scored how participants felt regarding the visual design of the search system as well as the experience as a whole. Coupling these qualitative notes with these quantitative data points gave us further evidence on whether the prototype met its key aims of improved usability, clear affordances and intuitive navigation — all directly tackling deficiencies of the original system, but also providing insights for last-minute tweaks.

C. Comparative Analysis

The new HCI-based library system was tested against older systems. The old e-library system was difficult for students to use, with confusing navigation and a dull interface that made research feel like a chore. In contrast, the new gamified version has made significant improvements. The layout is now more intuitive, with clear buttons and visual cues that guide users naturally, with achievement badges, progress tracking, and a cleaner layout that students find engaging. Future updates should focus on optimizing speed and adding personalization options, letting students customize their experience even further. Overall, the gamification approach has successfully made the e-library more engaging and user-friendly compared to the outdated previous version.

D. Results and Findings

The qualitative interviews with Ten (10) regular users of the E library to understand what works well and what needs improvement. Most people said the basic search function and saving features were easy to use, but several had trouble recognizing the old-fashioned floppy disk icon for saving files. Many suggested using clearer pictures or words instead. A major problem we found involves accessibility. People who use screen readers often couldn't tell what buttons did because they weren't properly labeled. While the system does show confirmation messages, these disappear too quickly for many users to notice. Several people recommended making these notifications more noticeable and allowing users to adjust how they appear. When comparing the library system to modern tools like Google Scholar, users said it feels outdated. They missed features that let researchers work together, like shared tags or comments. While the system does try to prevent mistakes, users still sometimes submitted things twice by accident or lost their work unexpectedly. Many found the citation tools confusing and asked for better instructions or visual guides. While the system handles simple searches and saving well, it needs important upgrades to its design, accessibility features, and advanced tools to keep up with what users expect today. Making these changes would help all types of users - from students looking up a single article to professors managing large research projects. The most needed improvements include clearer interface elements, better accessibility support, and more helpful error prevention.

VI. DISCUSSION

A. Interpretation of Findings

This investigation uncovers several important usability issues and improvement possibilities in the E library platform, all of which relate directly to the study's central inquiries. While the system performs adequately for simple searches, it falls short in several key areas: ease of use, support for diverse users, and effective communication of system status. These deficiencies create obstacles for researchers and present particular difficulties for those with special access needs, limiting the platform's effectiveness as a comprehensive academic resource. Research participants consistently recommended updating visual elements (such as substituting outdated save symbols with more contemporary imagery) and introducing multiple forms of system responses (including visual cues, sounds, and physical vibrations) to

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address current limitations. The data indicates that closing the divide between what the system currently offers (basic functions like locating and storing materials) and what users want (teamwork features and universal access) could dramatically improve the research process. The mismatch between how the system arranges content (using upload dates) and how users naturally think about organization (by topic or subject) reflects a common human-computer interaction problem of making technical systems work the way people expect them to.

- *RQ1. How does it feel to find features like the search bar or save button in the e-library system, and which icons or labels make it easier or harder for you to use them?*

- R1. The first respondent found the search bar and save button easy to locate due to clear icons, which improved their overall experience with the system.
- R2. Another participant noted the magnifying glass icon for search and labeled "Save" button were intuitive, but mentioned unclear icons could create confusion during use.
- R3. A third user reported that well-designed icons made navigation simple, but poorly labeled elements caused difficulties in operation.
- R4. One respondent appreciated the visible search function but criticized the small floppy disk save icon, suggesting a text label like "Save" would be more effective.
- R5. A participant suggested modernizing the interface with updated icons (cloud/heart symbols) and hover animations to improve both aesthetics and functionality.
- R6. Another user expressed frustration with advanced search features being buried in menus and the save button being too small relative to its importance.
- R7. One respondent recommended enhancing the search bar with trending suggestions and making the save feature show peer activity for a more engaging experience.
- R8. A screen reader user reported accessibility challenges, noting many buttons lacked proper labels which made functions like saving difficult to locate.
- R9. Another participant praised the system's clear labeling and icon design that made key features easily discoverable during use.
- R10. The final respondent highlighted how intuitive search and save functions significantly improved their ability to locate and store research materials efficiently.

- *RQ2. How does the system let you know when you've done something, like downloading a file or adding a research article to your project, and does this make you feel sure you did it right?*

- R1. The first respondent appreciated pop-up notifications and progress indicators that confirmed successful completion of actions.
- R2. Another user liked the brief confirmation messages that appeared after downloads or saves, which increased their confidence in the system.
- R3. One participant found that both pop-up alerts and visual icon changes provided adequate reassurance that tasks were completed properly.
- R4. A respondent acknowledged the existing confirmation system but suggested extending the display duration of success messages.
- R5. One user criticized the current brief download notification, proposing more engaging visual feedback like animated file transfers.
- R6. Another participant recommended incorporating haptic feedback (subtle vibrations) to better confirm actions when visual cues might be missed.
- R7. A respondent desired more satisfying audio confirmation similar to game sound effects when completing actions like saving items.
- R8. A visually impaired user found standard confirmation sounds too quiet and suggested customizable audio alerts for better accessibility.
- R9. One participant valued the system's confirmation messages that clearly indicated when tasks were successfully processed.
- R10. The final respondent reported occasional unresponsive download functions that created uncertainty about whether actions were completed.

- *RQ3. How do users of the e-library system feel similar to other tools you know (like Google or a library website), and what parts feel confusing or different from what you expected?*

- R1. The first respondent found the system generally familiar but noted some unique features like citation management required additional learning.
- R2. Another user appreciated similarities to common search interfaces but found document organization methods less intuitive than expected.
- R3. One participant described the system as comparable to mainstream tools but with some unconventional elements that initially caused confusion.
- R4. A respondent noted that while basic search functions mirrored other platforms, some organizational structures differed significantly.
- R5. One user criticized the interface as outdated, comparing it unfavorably to modern research tools with visual relationship mapping.
- R6. Another participant questioned the logic behind sorting saved items by upload date rather than more practical categories like subject.
- R7. A respondent highlighted the lack of collaborative features common in modern platforms, describing the system as isolationist in design.
- R8. One user pointed out accessibility shortcomings, particularly the absence of features like text-to-speech that are standard elsewhere.
- R9. Another participant acknowledged surface similarities to popular tools but noted unexpected differences in some functional areas.
- R10. The final respondent reported confusion when encountering nearly identical research items with only minor publication differences

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➢ *RQ4. How does the system help you avoid mistakes, like accidentally deleting a saved article or choosing the wrong citation, and do these features feel helpful or annoying?*

- R1. The first respondent valued confirmation dialogs that prevented accidental deletions of important materials.
- R2. Another user found warning messages helpful but occasionally frustrating when performing multiple rapid actions.
- R3. One participant appreciated system safeguards that effectively reduced common user errors during operation.
- R4. A respondent suggested improving citation selection interfaces to further minimize potential mistakes.
- R5. One user reported losing significant work due to the lack of warnings when closing active sessions.
- R6. Another participant noted inconsistencies in the citation system's auto-save function that sometimes created errors.
- R7. A respondent humorously suggested over-the-top confirmation measures to prevent any accidental data loss.
- R8. One user requested better visual differentiation between similar buttons to prevent mistaken duplicate submissions.
- R9. Another participant found the existing error prevention features generally effective in daily use.
- R10. The final respondent reported few issues with mistakes, crediting the system's pre-formatted citation options.

➢ *RQ5. When you first used the system, how easy was it to figure out tasks like searching for articles or organizing your research, and how did the system show you if you succeeded?*

- R1. The first respondent found basic functions intuitive to learn, with clear visual indicators confirming successful actions.
- R2. Another user reported that while searching was straightforward, organizational features required more time to master.
- R3. One participant appreciated the system's helpful hints and unambiguous success notifications during initial use.
- R4. A respondent noted that complex functions would benefit from additional guidance beyond the existing basic instructions.
- R5. One user humorously wished for an interactive guide to help with citation management during their early experience.
- R6. Another participant learned through experimentation, suggesting gamified tutorials could improve new user onboarding.
- R7. A respondent desired more visual organization methods similar to popular content curation platforms.
- R8. One user expressed frustration with the initial learning curve, recommending adjustable tutorial speeds.
- R9. Another participant had positive early experiences, particularly with the straightforward search functionality.
- R10. The final respondent found the system's built-in guidance and interface cues effectively facilitated initial use.

B. Contributions and Innovation

Significance and Contribution This study offers some valuable contributions to the field of educational technology, particularly for Digital Libraries. Translating those theoretical branches of HCI (for example, Norman's affordances or Nielsen's heuristics) into concrete interface fixes, this is a grounded practice of Theory in use. The new designed system has an ultimate responsive layout for students and administrators. The personalisation of the dashboard for students, the real-time status of the books, History of borrowed and returned books, Linking the profile with the courses, etc., makes the platform more intuitive and engaging. Theadministrator panel allows for efficient library management, allowing you to improve functionality with better control over what is available. It also includes adaptive navigation and smart feedback systems, providing a foundation for future AI-driven features like predictive book recommendations and voice search. (These improvements demonstrate how an iterative, user-centered design process can transform a former static and difficult to use system into an intelligent and responsive academic tool.)

C. Limitations and Future Work

While the study provided positive outcomes, several limitations should be addressed. This study involved only a very small fraction of the target number of participants to adequately represent the other user types or academic programs; therefore, the findings are not entirely generalisable. However, although the new thematic system has resolved most of the site usability concerns, it is still a failure in resolving technical problems of non-mobile responsiveness of the site, slower loading speed on low-end devices, and people with disabilities access problems. These shortcomings need to be addressed in order to ensure system usability for everyone.

Further research may include expanding the focus group to a broader demographic of students taking various courses throughout the multiple colleges. You must do usability testing on several devices and OSs, as well, to get a sense of how performant and responsive your app is under different conditions. In addition to those best practices, the other practical solutions, for example, WCAG compliance, need to be implemented to make sure your solution is accessible for everyone. Using features like voice search, AI-powered content suggestions, and gamified learning interactions will significantly increase user engagement and system adaptability. This focus will enable the e-library system, to evolve across successive iterations and become a more interactive, responsive, and resourceful tool for the academic community.

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VII. CONCLUSION

➢ *Summary of Key Findings*

In summary, incorporating UI/UX principles based on Human-Computer Interaction (HCI) theories has significantly improved the effectiveness and user satisfaction of the e-library system for students. The study started by identifying several usability problems in the original system, such as confusing icons, limited visual feedback, difficult navigation, and a lack of onboarding support. These issues were confirmed through task observations and structured interviews with BSIT students, some of whom used the system directly, while others shared their experiences with similar digital tools.

The redesigned prototype brought several enhancements, including clearer visual hierarchies, more intuitive navigation, real-time feedback, and mechanisms to prevent errors. These improvements were directly influenced by student feedback, with many highlighting the need for clear labels, familiar icons, and confirmation messages. Features like a personalized dashboard and organized book management workflows helped improve task efficiency and reduce confusion among users. Additionally, students expressed interest in modern features such as collaborative tagging, richer feedback cues, and customizable interfaces, reflecting a desire for more interactive and personalized academic tools.

Despite addressing many initial challenges, some usability gaps still exist. These include issues with the responsiveness, limited support for screen readers, and a lack of onboarding features for new users. The findings suggest that even more improvements such as integrating accessibility standards, adding contextual tooltips, and offering optional tutorial walkthroughs, could enhance the learning experience and ensure inclusivity for a broader range of users.

➢ *Final Remarks*

By focusing the design process on actual student feedback—whether from hands-on use or general expectations the study illustrates that user-centered, iterative design based on HCI best practices leads to a more engaging and effective system. This approach not only improves the academic experience but also aligns with broader institutional goals of fostering digital literacy and innovation in education.

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APPENDICES

A. Appendix A: Interview Questions

➢ Q1. How does it feel to find features like the search bar or save button in the e-library system, and which icons or labels make it easier or harder for you to use them?
➢ Q2. How does the system let you know when you've done something, like downloading a file or adding a research article to your project, and does this make you feel sure you did it right?
➢ Q3. How do users of the e-library system feel similar to other tools you know (like Google or a library website), and what parts feel confusing or different from what you expected?

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- Q4. How does the system help you avoid mistakes, like accidentally deleting a saved article or choosing the wrong citation, and do these features feel helpful or annoying?
- Q5. When you first used the system, how easy was it to figure out tasks like searching for articles or organizing your research, and how did the system show you if you succeeded?

B. Appendix B: Observation Notes

Observation Date: April 20, 2025

Location: School Campus

Observer: Salmeo, Khyla

Yongco, Shienna

Participant: BSIT Students

Observation Date: October 21, 2025

Location: School Campus

Observer: Salmeo, Khyla

Yongco, Shienna

C. Appendix D: Thematic Analysis Codes

- *Theme 1: Design and Usability*

- *Code 1: Outdated Design*

- ✓ *(R1) "The layout looks very common and basic and it needs an upgrade."*
- ✓ *(R2) "The interface feels outdated and in need of an upgrade."*
- ✓ *(R5) "The system felt outdated, causing delays."*

- *Code 2: Icon and Label Clarity*

- ✓ *(R2) "It's helpful that the search bar and save button are easy to spot. The magnifying glass icon for search is familiar, and a clear label on the save button makes it easier to use."*
- ✓ *(R5) "The search bar blends into the header like camouflage. I nearly missed it! That floppy disk 'Save' icon is a museum piece - my generation expects a cloud or heart icon."*
- ✓ *(R8) "As a screen reader user, half the buttons are just 'link' or 'button 358' to me. The search bar is properly labeled, but the 'Save' function might as well be invisible."*

- *Code 3: Navigation and Layout*

- ✓ *(R3) "Simple to use when icons are clear; unclear when they're not."*
- ✓ *(R9) "The features like the search bar or save button really helps me whenever I visited the e-library system." However, issues arose regarding the location of features.*
- ✓ *(R5) "Finding the advanced search is like an archaeological dig - three menus deep."*
- ✓ *(R6) "The 'Save' button is microscopic compared to my thumb. Make important features AT LEAST as prominent as the copyright notice."*

- *Theme 2: System Performance and Efficiency*

- *Code 4: Feedback and Confirmation*

- ✓ (R5) "When I download, a tiny text box appears for 0.2 seconds. I'd prefer a colorful animation - maybe books flying into a virtual backpack."
- ✓ (R6) "Completed actions should trigger subtle vibrations on my phone like Tinder matches."
- ✓ (R7) "When I add to my project, I want to hear a soft 'bloop' like collecting coins in Mario."

- *Code 5: Error Prevention and Clarification*

- ✓ (R1) "Having an error prevention like asking for confirmation before deleting is way easier to make sure that you really want to delete that data or article you found."
- ✓ (R4) "Confirmation dialogs prevent accidental deletions, but citation selection needs improvement for clarity."
- ✓ (R5) "I once lost three hours of work because there's no 'Are you sure?' when closing tabs."

- *Code 6: System Performance Issues*

- ✓ (R1) "The system's slow response and data being erased make it harder to efficiently access resources." (R5) "Frustration with the interface, especially delays."
- ✓ (R7) "Delays and inefficiencies made tasks less efficient."

- *Theme 3: Features and Functionality*

- *Code 7: Positive Features*

- ✓ (R4) "The search bar was particularly helpful."
- ✓ (R8) "The search bar made it easier to find resources."

- *Code 8: Need for Customization*

- ✓ (R8) "Give me customizable notification sounds - let me choose between a gong or a gentle 'task complete' chime."
- ✓ (R7) "The search bar is lonely at the top - why not show trending searches like Twitter?"

- *Code 9: Task Completion*

- ✓ (R9) "The first time I used the system it was easy to figure out the tasks like searching for articles or organizing the

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research because it already shows in the system what to do."

➢ *Theme 4: Comparison to Other Tools*

- *Code 10: Familiarity with Other Systems*

✓ (R1) "The e-library system felt like similar to other online library portals, making it easy to use and find data like articles."
✓ (R2) "The system feels a bit like using Google or a school library site, which makes it easier to use." However, some users noted certain limitations in the system's features compared to other platforms.
✓ (R5) "It's stuck between a 90s library catalog and a government website. Google Scholar shows me related papers in a visual web - here it's just... lines."

- *Code 11: Confusing Aspects*

✓ (R6) "Why does 'My Collection' organize by upload date instead of subject?"
✓ (R7) "It's like using a fax machine when my brain lives in Slack and Notion. Where's the collaborative tagging?"

➢ *Theme 5: User Experience and Engagement*

- *Code 12: Trust and Confidence*

✓ (R6) "I have to check my list repeatedly like I have trust issues."
✓ (R7) "The only feedback is my growing existential doubt about whether anything actually saved."

- *Code 13: Desire for Interactive and Engaging Features*

✓ (R7) "The 'Save' button should glow when my study group members also saved this source. Make research feel social."
✓ (R5) "Make buttons pulse gently when I hover over them."