Turning to a New Chapter: Improving the Nassau Public Library Mobile App User Experience

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Abstract

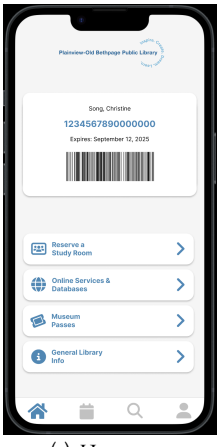
For many communities, the public library is the center of valuable resources. Yet, in today's modern world, gaining access to these materials often requires a reliable experience through a website or mobile application. Unfortunately for the Nassau Public Library users, its library app garnered a 2.3 star rating on the App Store, demonstrating user dissatisfaction with its frustrating design. The website is also ill-adapted for the mobile experience, often resulting in overwhelming amounts of information on a single page and clunky navigation. Given its important role in the community, an evaluation of the design for a more modern and organized display of its digital resources is needed. Among the redesign changes were reducing redundant information, implementing a minimal yet intuitive interface through recognizable icons, and enabling greater user control over their navigation and choices. Through the implementation of Gestalt principles, heuristic evaluation, and other human-computer interaction concepts, many of the design flaws that impeded a smooth user experience were addressed, ultimately producing an inclusive, user-friendly design to facilitate a welcoming library interface that stands out among its outdated peers.

1. Introduction

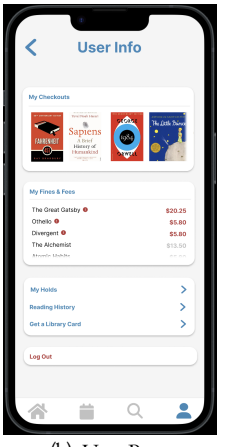
In Nassau District, student group study sessions, official community gatherings, and lessons for new hobbies all take place in the public library. With more librarians recommending the mobile application for forgetful visitors who have lost their library card, students struggling to find volunteer opportunities, or parents searching for family events to enroll their children in, a lacking mobile app user experience is a disservice for a large proportion of the community. Minimal user flexibility/control, overwhelming amounts of information per page, lack of variety for differentiation between options, and scattered components were among the many noticeable flaws. To approach this redesign task, other library applications were studied and compared to understand the current standard designs. It was discovered that many of the available mobile applications followed similarly outdated interfaces. Reviews also mainly addressed the backend inconveniences rather than the user interface. Consequently, other popular mobile interfaces such as Instagram, Barnes & Nobles, Google Calendar, and Reddit were also referenced. These comparisons produced a firmer understanding of the current mobile app conventions that many users have most likely become familiar with. Standard navigation bar layouts, conventional icons, widget/alert layout, and color distribution were all derived or inspired from these references. It was also determined through the case studies that the main goal for the new design was to limit the number of redirects, layers of subdirectories, and text description. Through this basis, the old Nassau Library App's components were slowly reintegrated – taking the user's most frequently visited pages into consideration when ordering by precedence.

2. Design and Rationales

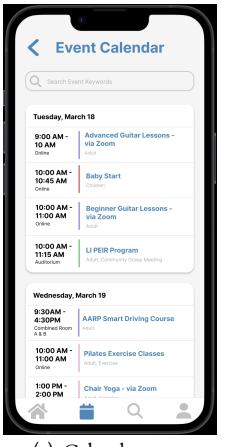
The previous design was overwhelming and easily dispersed the user's attention with the large variety of colors, text descriptions, and subdirectories that it presented. Thus, the redesign process focused on a cleaner and more minimalist interface to focus attention on the higher-priority/frequently-visited features for an efficient search and recognition process.



(a) Homepage



(b) User Page



(c) Calendar page

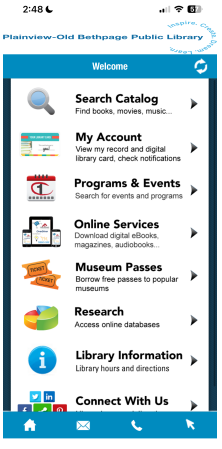
Figure 1. Redesigned pages

2.1 Homepage

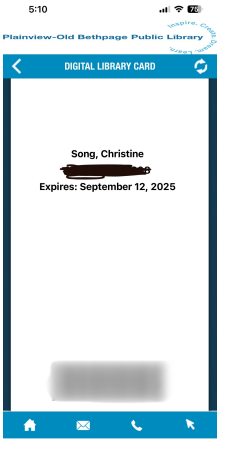
The information contained within the widget also suffers from similar design flaws. As Raluca Budiu, senior director of Nielson Norman (a user experience consulting firm) states, a design seeks to reduce interaction costs – "the sum of efforts — mental and physical — that users must deploy in interacting with a digital product in order to reach their goals" [1]. Yet we miss this goal with our current homepage's inner widget layout. Firstly, there are already three subparts to each widget: an image, a label, and a description. For each widget to have multiple subparts, it violates this idea to reduce the amount of effort the user must expend to find the subdirectory they must navigate to. The image has its own intricate designs, details, and colors which diverts user attention and spends precious time to interpret the icon. The combination of these problems significantly impedes a smooth and efficient user experience especially when the same issue persists for over eight different widgets. To tackle this major issue, all text descriptions were removed and the images/icons were altered [*Figure* 1*a*]. In terms of the icons, their main concern was its unnecessarily descriptive and colorful appearance, so they were replaced with simple, outlined, monotone icons. While keeping them easily recognizable, this change seeks to minimize attention to the icon and instead to silently aid the process of finding the right subdirectory through the labels alone. To improve accessibility, the size of the widget label was also made larger, allowing them to be resized with the phone's text zoom that many seniors who suffer from nearsightedness rely on – a feature unimplemented in the previous design. The new design now contains a minimalist icon and a concise label in a single widget, much like the current conventions one would observe in navigation menus for apps such as Reddit, Instagram, and Youtube.

The app is currently most frequently referred to library visitors by librarians due to its online library card feature. The previous design requires the following traversal: "My Account" -> "Digital Library Card" all within a cluttered hierarchy of over 10 choices [*Figure* 2*b*]. Yet, given its importance in the app identity, its visibility and ease to reach propelled a design that reflected its position as the topmost feature on the homepage. This location serves as a focal point and its larger size and margin space respective to the subdirectories capture user attention when they open the app. It was also made clickable to center the card and facilitate comfortable physical scanning at the library [*Figure* 2*c*].

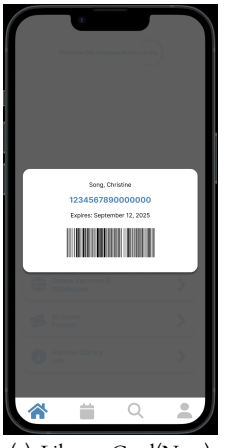
Another thoroughly-visited digital library resource is the page for high school students to reserve study rooms. The current mobile app does not directly offer access to this page, but the user may visit the website to do so. Given that a large subset of the application users are students, the addition



(a) Homepage (Old)



(b) Library Card (Old)



(c) Library Card(New)

Figure 2. Homepage designs

of this feature was deemed important for inclusion in the redesign, so the "Reserve a Study Room" subdirectory was also appended to the widget list.

To summarize the variety of individual changes made, the redesigned homepage now presents four subdirectories with a library card, a significant reduction from the original eight. Combined with the color scheme, limited to a blue/black duotone, the redesigned elements contribute to a clean and efficient overall layout.

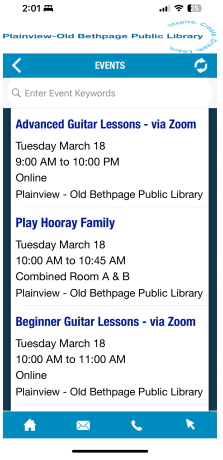
2.2 Calendar Page

As the title suggests, the "Event Calendar" page provides information on ongoing and upcoming community events for individuals to register in. The original Event Calendar lacked a variety of text size, boldness, and colors, making it extremely difficult to visually identify desired information [*Figure* 3*a*]. Thus, filtering for specific items, such as dates or types of events is rendered virtually inefficient due to this uniformity. To approach this significant issue, I employed Gestalt Laws.

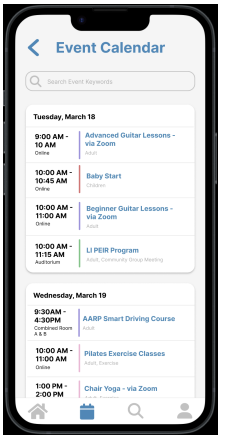
The first was Gestalt Law of Proximity: I grouped same-day events in a single box, leaving a margin between dates for easy grouping [*Figure* 3*b*]. Thus, if a user knows they are not searching for events on "Tuesday, March 18" they can easily move to the next box, instead of individually checking for the next event that does not list its date on "Tuesday, March 18". They are also able to collapse the entire day (and thus the relevant events) by a simple tap on the date, allowing for more convenient search to ignore days a user knows does not fit in their schedule.

The second was the Law of Similarity, using similar colors, positioning, text, and sizes to facilitate visual sorting and grouping [*Figure* 3*c*]. For instance, the color-coded tags were borrowed from the library website to mainly target individuals interested in specific age ranges (children, adults, community groups, etc). Families looking for events they can attend with other children would only need to look out for the color red, rather than having to check the age range after clicking an event of interest (as the original design did). The event times are all segregated to the left, bolded, sorted, and enlarged so users can comfortably search for the times that work best for them.

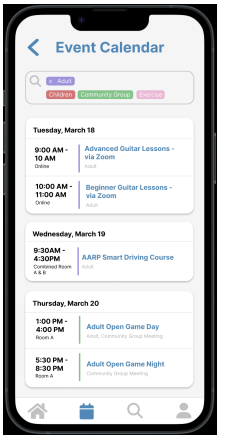
Overall, this new layout allows users to intuitively find the information they need. For instance, individuals with restrictive schedules are likely to focus on the left side of the screen, while those browsing casually can explore event names on the right. This separation ensures both types of users avoid unnecessary retrieval of information and effortlessly locate what matters most to them.



(a) Calendar (Old)



(b) Calendar (New)



(c) Event Search (New)

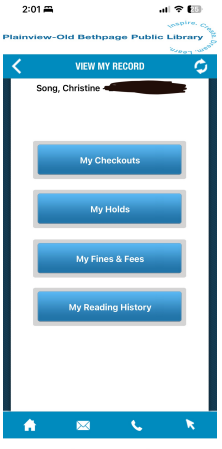
Figure 3. Calendar designs

2.3 User Page

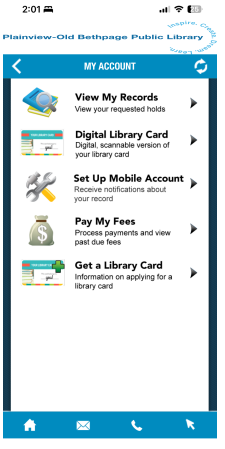
One of the most standardized design features for modern-day applications was missing in the old design: the user page. While the application had many pages dedicated for the user, it was listed within the hierarchy on the homepage rather than in the traditional rightmost corner of the navigation bar. To follow these consistency/standards from Heuristic principles, this was implemented. The user page was redesigned to highlight the most frequently-accessed and important information for the average library visitor [*Figure* 1*b*].

The highest priority for a library visitor often goes to checking fees and books they've checked out. In an article written by Jennfier Dixon and Steven Gillis from the Library Journal, "a non negligible proportion of librarians and patrons have long considered fines at best an unpleasant hassle" [4]. She elaborates that the issue becomes prominent when " families incur huge fines because of a vacation" and that fines "impact those who can least afford it" [4]. Given this context, it is especially crucial to alert users when they have incurred fees and unpaid dues, and prevent such fees from occurring by reminding them of books that have not yet been returned. For instance, consider a parent who must cross-check the specific books they must return that all their children have borrowed. It is extremely easy to lose track of what their child is still reading, or what has already been returned, thus the "My Checkouts" widget presents the unreturned books' covers, offering the users a visual aid to easily identify the books they must return. The "My Checkouts" page also mimics a traditional bookshelf (H-2 match system with real world) playing with the Law of continuity. Due to the color and positioning of these features, it is the most eye-catching and serves as a good reminder, with a blurry edge gradient using Law of Continuity to indicate hidden books in the carousel.

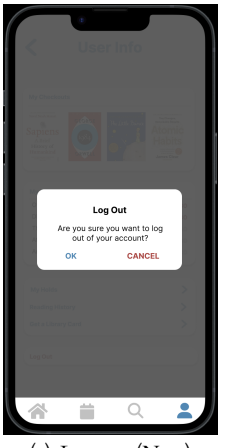
The previous design also failed to provide clear affordance in the logout button [*Figure* 4*b*]. Instead, the user logout function is at the bottom of the user page (as convention in other apps). It is styled as bold red text to stand out as the focal point for the user, encouraging easy identification. A clear confirmation prompt, "Are you sure you want to log out," follows, providing the user with the flexibility to cancel if needed. [*Figure* 4*c*].



(a) User Page (Old)



(b) User Page (Old)



(c) Log out (New)

Figure 4. User page designs

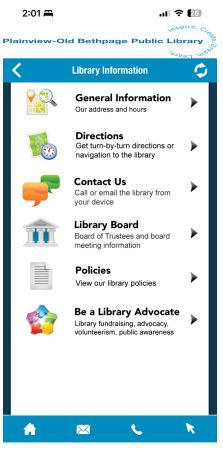
2.4 General Information Page

The General Information tab – navigated to through the homepage – incorporates features that were widely scattered across the old design, making it another important redesign focus. The most noticeable change is the Google Maps API which is commonly used in Instagram and other current applications when aiding the user with information pertaining to location. As Microsoft recommends, "With a large amount of text, less dense words and sentences makes reading an easier task—important for overall communication" [2]. Thus the address was listed, accompanied with the map. Moreover, librarian Pauline Dewan states in a scholarly article that pictures are not only more effortless to recognize and process than words, but also easier to recall [3]. To prevent deterring the users from wanting to learn how to find the library (which you may only access after redirecting to the website and reading the long text), this combination is favorable, facilitating easier memorization as visuals and short text make it easier to recall.

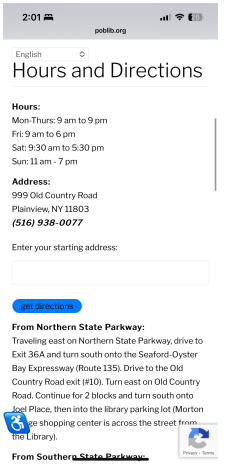
As aforementioned, the original layout [*Figure* 5*a*] also had the issue of scattering the contact information into many different hierarchy levels and positions: the navigation bar, "Connect With Us" Subdirectory, and the "Library Information" subdirectory. In order to group it in one place for the user to intuitively recall as the contact information location, they were all put into the general information tab, in a single row format to group through Gestalt's Law of Proximity [*Figure* 5*c*].

This page also included the "Library Board" information, library policies, and "How to be a Library Advocate" which were all redirects to the website. Library Policy was kept to inform users of the important policies, but it was formatted directly on the application instead of redirecting to the website. The other information was excluded from the redesign, as the average user would not be searching for this information unless directed by a librarian to the official website where such information is much more comprehensive. Future iterations may consider including it to prevent discrepancies between the website resources and the mobile application, however given the goal to minimize introducing the average user with unnecessary information, it is not included.

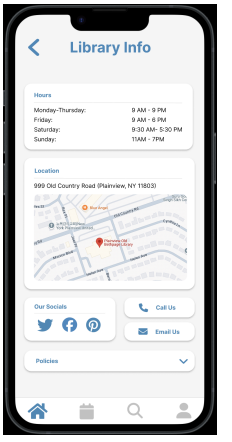
3. Heuristic Evaluation



(a) General Info (Old)



(b) Directions (Old, Web)

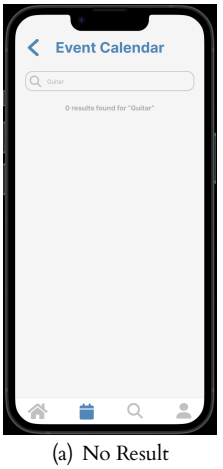


(c) General Info (New)

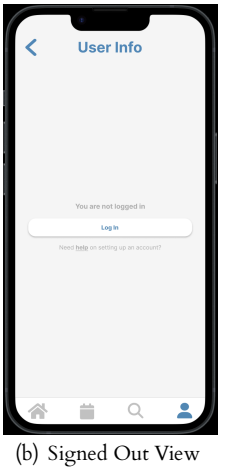
Figure 5. General information page designs

3.1 H-1: Visibility of System Status

The first heuristic is visibility of system status, dictating that the system should maintain a reliable form of feedback with users, specifically on the understanding of the system's current state. The old design provides an abundance of elements that provide users with clear system status visibility; loading screens exist during the retrieval of user data and search queries. Thus, this is carried forward in the redesign. The search functionality of the library's online database query has not yet been implemented on the mobile app itself which would typically require more real-time feedback. However, the redesign still includes the loading screen for the event search [*Figure 6c*]. The original design also includes "0 results found" in the case where the returned result is null (which the redesign continues to implement) [*Figure 6a*].



(a) No Result



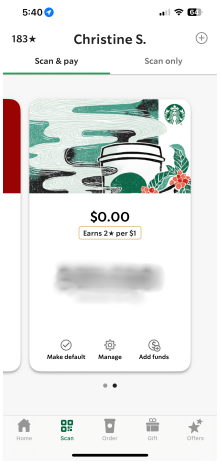
(b) Signed Out View

(c) Loading Events

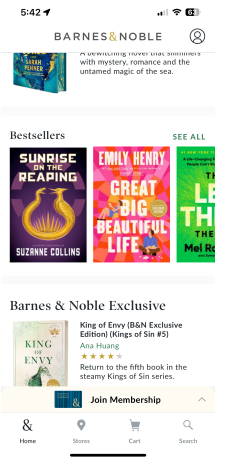
Figure 6. Redesigns with H-1 taken into consideration

3.2 H-2: Match System and Real World

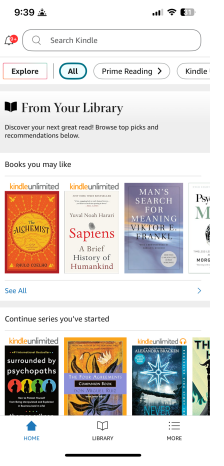
Heuristic number two encourages the use of real-world inspiration/mimicry of interface features. This may take the form of a trash can icon for deleting or a magnifying glass for zoom. The original interface does not match the system with real world, utilizing buttons for nearly every navigation, action, and toggle. To make the application more intuitive, the "My Checkouts" is designed to resemble a bookshelf or a carousel (as used in many applications such as Barnes & Nobles or Kindle [*Figure* 7*b*, 7*c*]), encouraging intuitive horizontally scrolling to see all borrowed books. On the other hand, the "My Fines and Fees" feature scrolls vertically to reflect the format of lists on financial documents as conventionally listed on paper. Additionally, the library card on the homepage mimics its real-world counterpart (taking inspiration from the Starbucks mobile card deck [*Figure* 7*a*]), making it a natural and familiar course of action for users to tap on it – as if picking it up – to isolate it for scanning.



(a) Starbucks Card Deck



(b) Barnes&Nobles Library



(c) Kindle Library

Figure 7. System and Real-World Matching Conventions

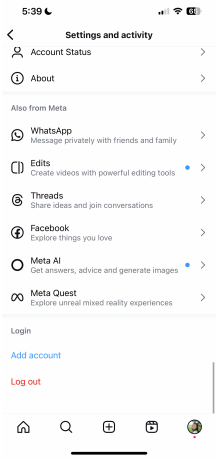
3.3 H-3: User Control and Freedom

User control and freedom indicates that users should be able to undo their unwanted state. The original design demonstrates user control when allowing users to cancel their logout decision. This was continued in the redesign: the logout button has a "cancel" button to allow users to revert their action [*Figure* 4*c*]. However, the original interface fails to provide a back button in some hierarchies (often in the third or fourth hierarchical level), preventing the user from easily going back a hierarchy and instead forcing them to revert back to the home screen. To combat this, the redesign limits the subdirectory levels to between 1-3 hierarchies and ensures the back button is present on every page. The Google Map API also allows the user to zoom in and out and also move to gain a better understanding of the surroundings offering them the freedom to explore outside the 300 x 200 pixel box size [*Figure* 5*c*].

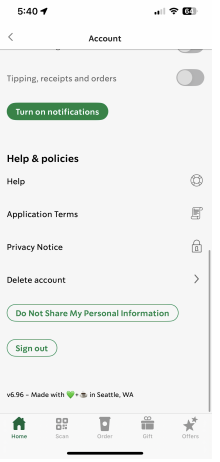
3.4 H-4: Consistency and Standards

The consistency and standards heuristic is a proponent for following established patterns for predictability and consistency, either within the same product, or across a family of products. At

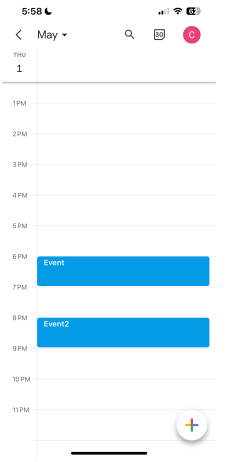
times, the original interface swaps between redirects to the mobile website or a redirect within the application. Other times, it removes the back button from the top navbar. It also fails to implement modern practices found in other applications that handle account pages. The original interface follows a general consistency from other library applications, but many of these standards are outdated for modern applications (e.g. the detailed icons, or the calendar widgets, account information presentation, and subdirectory layout). Since, this design conflicts with many of the previous heuristics, the redesign will seek to prioritize standards from more modern interfaces.



(a) Instagram Log Out



(b) Starbucks Log Out



(c) Google Calendar

Figure 8. Popular app conventions

As prefaced before, the redesign incorporates many conventions from popular modern mobile applications (such as the Instagram or Starbucks app [*Figure* 8*a*, 8*b*]), practicing external consistency. This includes the navigation layout which includes a home button, a search, and an account page. The logout button was also included at the bottom of the account page to mirror how other account settings are handled. The calendar app also took inspiration from Google Calendar [*Figure* 8*c*] in terms of the time/event layout, providing a sense of predictability for new users. The navigation/back-button/collapse/expand buttons are all consistent throughout the different pages as well, upholding internal consistency for users to comfortably adjust to.

3.5 H-5: Recognition Rather than Recall

Recognition rather than recall prioritizes cues and visual aids to allow easy identification to improve user experience, rather than relying on memory recall. The original interface fails this heuristic in the aspect that the search function does not offer any recommended keywords, nor does it provide any tags to filter by. This causes the search functionality to suffer in specifically the event calendar lookup, as many users may not know exactly what the age group is labeled as or the event types that are offered. Thus, it would be an important functionality to enhance for future iterations.

The new calendar page is the most prominent example of the fulfillment of this heuristic, allowing search based on age groups by simply clicking on the associated tag, a user flow which does not rely on a user's memory of the different age groups. All subdirectories, buttons, and redirects are also appropriately labeled so the user expects a certain function for each interaction without having to recall.

3.6 H-6: Error Prevention

Error prevention emphasizes interface which reduces the need for users to correct mistakes, thus minimizing the chance of them occurring in the first place. The original design itself does not have much error prevention. This may mainly be due to the fact that many of the data-heavy functionalities are often redirected to the website which is a different system. The error prevention that does exist is the null exception where the search returns "0 results for…" or the checkout returns " checked out items - 0" instead of throwing an error. Selecting checkouts without an account will simply return that the user is not logged in, however to maximize error prevention, it would have been more optimal to remove that choice entirely.

The redesign works to continue this by setting an explicit "You are not logged in" and removing all user functionalities/subdirectories in this case to prevent illegal access to nonexistent information [*Figure* 6*b*]. The redesign also offers the "Are you sure you want to log out of your account" prompt in the case of accidental log out [*Figure* 4*c*].

3.7 H-7: Flexibility and Efficiency of Use

The flexibility and efficiency of use heuristic encourages use of shortcuts which enhance the speed of interaction for more experienced users. There are no known shortcuts or multiple ways to approach the same task in the original design. For instance, the only way to search by event tag is by filling in the entire tag name manually. However, the redesign seeks to improve this by providing two ways to search: either through manual input or tag selection [*Figure* 3*c*].

3.8 H-8: Aesthetic and Minimalist Design

Aesthetic and minimalist design dictates that interfaces should not present irrelevant information, as it competes with relevant units of information and decreases visibility. The original design failed to present the information in a minimalist structure. The attention is dispersed due to the large amount of information gathering required for such a layout. Thus, it impedes a natural visual order and distracts the user from efficiently achieving their goals. This is especially prominent in the homepage (where the widgets are filled with a variety of text, colors, and images) and the directions to the library (where the roads and directions are written). Consequently, the visual Google Maps API is used to replace the wall of text that was present for the directions to the Plainview Library [*Figure* 5*c*], cutting down the amount of words present while simultaneously making it pleasing to the eye. The widgets in the home page only have a few words accompanied by a simplistic icon which fosters a minimal and clean interface for easy visual search.

3.9 H-9: Help Users Recognize, Diagnose and Recover From Errors

This heuristic is fulfilled by previous discussions of the null handling in the application. Instead of returning "null" or technical jargon, the application returns the errors in human words – for instance "No matches found" for the search functionality. The redesign also takes this one step further by listing if the user is not logged in and offering help documentation for those who may require additional help [*Figure* 6*c*].

3.10 H-10: Help and Documentation

There is currently no help or documentation available for struggling users in the original design. The redesign attempts to provide a solution by providing a "help" button for those who may struggle to start an account [*Figure* 6*c*].

3.11 Summary

Based on this comprehensive heuristic evaluation, it was found that the original design suffers from many design flaws, the main concerns being the lack of minimalist design, user control and freedom, visible system status, help documentation and system-real world matching. To target these issues, redesign focused on incorporating more loading graphics to enhance visibility of system status and designing a more minimalist layout to focus user attention on the important features. Hence, with the conclusion of this evaluation, a more comprehensive and well-rounded design was produced.

4. Discussions and Future Work

Limitations existed for this design study, mainly due to the lack of user feedback for both the old and new design. As a result, no quantitative analysis was conducted which implies a lack of generalization/repeatability. Future studies will refer to a more in-depth and comprehensive analysis of the app's audience. This could take the form of interviewing different age groups, and performing focus groups with the community members to simulate a more natural user experience.

However, this current study still attempted to account for the large variety of user demographics, focusing on accessibility with text for the senior population, standard modern display for young adults, and organized/concise handling of various user data for parents. The redesign also takes inspiration from current design trends of popular applications, hoping to relay an intuitive and recognizable interface. It improves the major issues that were impeding a smooth user experience, including accidental logout, restricted screen routing, dead links, and text overflow.

Through this experience, I learned the difficulties of only relying on heuristic evaluation for redesign. While a low-cost alternative to a formal experiment, heuristic evaluation has the downside of not being an accurate reflection of a real user experience, thus it was challenging to try and encapsulate all angles of design concerns. However, the heuristic evaluation did highlight many existing design flaws and provided a sense of direction for future redesign iterations. This includes providing a help documentation icon at the top right of the screen, equipping users with FAQs as well as other relevant information for those who face difficulty navigating through databases or registering for events to explore the fulfillment of the tenth heuristic principle. Future efforts will also include incorporating more of the website's functionalities in the application, allowing users to enjoy the full coverage of resources that the library has to offer without having to rely on two separate sources for information.

5. Conclusion

Through heuristic evaluation and outside research, the redesign hopes to improve user experience quality, overcoming the barrier of discomfort that may have repelled potential users.

It was found that the original design lacked many human-computer interaction principles which are foundational for a cohesive interface design. Thus, with creating a digestible and simple design as the target, we worked to create an easy-to-understand interface that takes inspiration from current popular mobile applications such as Instagram and Reddit and other current library applications to enhance the intuitive nature of the redesign. By streamlining navigation, reducing hierarchy, and enhancing user control through consistent design, the new interface aims to provide community members with easy, mobile-friendly access to essential information, resources, and opportunities.

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