Article

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Designing Integrated Online Finding Aids: Leveraging Content Analysis and Design Thinking for Effective Site Navigation and Wireframe Development

Abstract: Online Finding Aids (OFA) portals are essential for providing access to archival records. However, many existing systems suffer from fragmented interfaces that separate content from catalogue access, leading to poor usability and user dissatisfaction. This study aims to design site navigation and wireframes for an integrated OFA portal that enhances user experience, accessibility, and usability through a unified, single-window approach. The research combines content analysis and design thinking to address this challenge. First, 10 prominent archival websites were evaluated to identify patterns and issues in navigation and content presentation. These findings informed a structured design thinking process comprising empathy mapping, problem definition, ideation, prototyping, and testing conducted through collaborative workshops with archivists, researchers, and designers. Wireframes were developed using Figma to visually represent an integrated platform that unifies content management and archival catalogues within a streamlined interface. Unlike traditional archival systems, which require users to switch between separate websites for institutional content and finding aids, the proposed wireframe consolidates both into a single, user-tested platform. Usability testing with 10 participants using the System Usability Scale (SUS) yielded an average score of 84, indicating excellent usability and user satisfaction. The resulting wireframe introduces intuitive navigation and integrated content management features that eliminate the need for separate systems. This study contributes a replicable and evidence-based framework for improving the usability of archival websites and sets a practical foundation for developing user-centred online finding aids.

Keywords: online finding aids; archival portal; site navigation; wireframe; design thinking; user-centred design

1 Introduction

Online Finding Aids (OFA) portals are vital tools in the digital age, enabling researchers and the public to access historical, cultural, and administrative records efficiently and remotely (Dong et al. 2010). These platforms enhance archival accessibility, support preservation by minimizing physical handling, and offer scalable digital infrastructures for long-term access (Conway 2010; Trifunović 2024; Keneley et al. 2016). However, the success of digital preservation strategies ultimately depends on the usability and coherence of the portals through which resources are accessed (Bountouri 2017). A persistent challenge in many institutions is the fragmentation of their digital presence across separate content management systems (CMS) and archival finding aids, leading to disjointed navigation, redundant maintenance, and a diminished user experience. This study addresses that gap by proposing the design of an integrated, standalone archival website that unifies institutional content and finding aids within a single platform to enhance navigability and user satisfaction. Drawing on a dual-method approach, the study combines a comparative content analysis of 10 prominent archival websites, including the World Bank and UNESCO Archives, to examine prevailing structures and user interface patterns, with a design thinking methodology to iteratively generate, prototype, and test user-centred solutions (Brown 2009; Krippendorff 2019).

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The application of user feedback–driven wireframing, employing both low- and high-fidelity prototypes (Arnowitz et al 2007), is a critical mechanism for translating design insights into actionable interface improvements. Through this process, the research aims to establish a replicable model for improving online finding aid usability, offering best practices for developing cohesive, accessible, and user-friendly digital archival environments.

2 Objectives of the Study

– To evaluate the navigation systems of 10 prominent archival online finding aid portals, identifying structural patterns and usability features
– To compare the organization and presentation of content across selected portals to identify design inconsistencies and areas for improvement
– To identify common navigation challenges that hinder user experience and propose best practices to enhance usability
– To develop and recommend an integrated design solution through wireframes and site structure that improves navigation efficiency and overall user satisfaction in online finding aids

3 Background of Study

The accessibility and usability of archival materials are fundamentally influenced by the design and functionality of archival websites, particularly for academic and research communities that rely on efficient access to historical and scientific records. This study focuses on the Indian Institute of Astrophysics (IIA), an autonomous research institution under the Department of Science and Technology (DST), Government of India, which has been a leading center for astronomical research since 1786. The IIA archives encompass over 10,000 collections distributed across multiple observatories, including Bangalore, Kodaikanal, Kavalur, Hosakote, Gauribidanur, and Hanle, with centralized management in Bangalore. Although IIA has maintained a web presence since 2008 and initiated efforts such as online exhibitions, its archival interface faces a challenge common to many institutions – the separation of content management systems (CMS) and online finding aids (OFA) – leading to fragmented navigation and a disjointed user experience. Research has shown that well-designed archival websites significantly enhance user engagement and resource discoverability (Sarkar

and Biswas 2020). The present study proposes an integrated approach that merges institutional content and archival catalogues into a unified, user-friendly platform to address this issue. By applying content analysis and design thinking methodologies, this research aims to develop wireframes prioritizing intuitive navigation, user-centred design, and functional coherence. The study seeks to contribute practical design recommendations that align advanced cataloguing technologies with responsive, accessible, and streamlined user interfaces, enhancing the overall engagement experience with digital archival resources (Fimberg and Sousa 2020).

4 Review of Literature

4.1 Purpose of Archives

Archives function as specialized repositories committed to collecting, preserving, and facilitating access to records of enduring value, including historical manuscripts, digital content, and multimedia artefacts (Maidabino 2010; Arumugam et al. 2024b). These institutions are vital for safeguarding cultural heritage, supporting legal and administrative functions, and enabling long-term institutional memory (Thorpe 2024; Friedewald et al 2024). As most archival materials are inaccessible via interlibrary loan, archivists increasingly rely on digital communication tools to respond to remote reference queries, reinforcing the essential role of archives in documenting societal narratives (Regehr et al. 2023; Nurbatyrova et al. 2024).

4.2 Evolution and Importance of Finding Aids

The concept of finding aids, first introduced in the mid-twentieth century, remains foundational for facilitating intellectual access to archival collections. These tools provide descriptive and contextual information to guide users through complex holdings (Chung and Irwin 2017; Wiedeman 2019). The shift to digital access has transformed user expectations, with contemporary researchers seeking seamless, immediate, and online discovery of archival content (Pitol 2019). Although many archival portals have evolved to include more advanced features, their usability remains inconsistent. The ability of a website to provide intuitive navigation and accurate collection-level descriptions has become a core

measure of effectiveness (Chapman 2010; Bountouri 2017; Eidson and Zamon 2019; Karp 2024).

4.3 Barriers to Usability in Archival Interfaces

Despite improvements in metadata standards such as Encoded Archival Description (EAD), challenges remain due to interface complexity and system fragmentation. Both scholars and archivists face navigation barriers: researchers typically approach finding aids with keyword-driven strategies, while archivists leverage detailed knowledge of collections. However, both groups encounter usability limitations arising from non-intuitive menu hierarchies, inconsistent metadata presentation, and underdeveloped search functions (Borlund et al 2024).

Chapman (2010) observed that convoluted interface structures, such as deeply nested menus or varying layouts across pages, often disrupt user orientation. These inconsistencies reduce efficiency and hinder users from forming a clear mental model of the website's architecture. Garrett (2011) further emphasized the need for interface elements that align with user expectations, especially about navigation and information discovery. On mobile platforms, limited screen space demands additional design considerations such as responsive menus and simplified navigation paths (Al-Qallaf and Ridha 2018; Dewiyana 2021). These findings underscore the need for user-tested design, robust metadata structures, and adaptive interfaces.

Emerging digital technologies add further complexity to the archival landscape, introducing challenges in preserving, contextualizing, and providing meaningful access to born-digital and digitized records (Conway 2010; Jaillant et al. 2022). However, no universally accepted model for online finding aid navigation currently exists (Walton 2017), and conventional evaluation methods such as surveys often fail to capture users' cognitive and emotional engagement (Dewiyana 2021).

Numerous studies advocate for the systematic usability evaluation of library and archival websites to meet evolving user needs (Arumugam et al. 2024a). Some studies have identified widespread inconsistencies in homepage structures, information architecture, and usability practices across more than 1,400 institutions in large-scale reviews of academic and public library websites. These insights reinforce the value of content analysis as a method to assess how effectively archival websites provide navigational clarity and content accessibility (Krippendorff 2019).

4.4 User-Centred Design (UCD) and Accessibility

Practical user experience (UX) design relies on intuitive menu structures, clearly signposted content areas, consistent page transitions, and robust search capabilities (Fang and Holsapple 2007; Dong et al. 2010). Incorporating user-centred design (UCD) principles and usability testing has become essential for developing accessible and efficient digital archival platforms (Yoon et al 2016). UCD encourages the involvement of users throughout all stages of design, from requirements gathering to interface testing, enabling a deeper understanding of user expectations and pain points (Devi et al 2012). Regular feedback loops and iterative testing are crucial for improving long-term usability and accessibility (Lanter and Essinger 2017; Hu 2012). While UCD is well established in the library and museum domains, it remains a relatively novel but necessary approach in archival systems.

4.5 Integration Challenges and Case Studies

Another significant usability challenge arises when institutions maintain separate general content management platforms and archival descriptions. This duality often results in fragmented interfaces, inconsistent metadata, and disjointed user experiences (Jain et al 2019). Integrated platforms offer a compelling solution, enabling unified search, consistent navigation, and streamlined backend management (Altman and Nemmers 2001). Integration simplifies maintenance workflows and enhances front-end usability by consolidating content into a single coherent system.

A notable example of the successful implementation of these principles is the CAMPAS (City Archives Management and Public Access System) developed by the City of Sydney Archives. To overcome the challenge of managing archival materials across 13 outdated systems, the City integrated them into a single, user-friendly platform. CAMPAS was designed to manage all metadata and digital assets through an intuitive portal that promotes self-service access and consistency (Smith and Villata 2020). This case demonstrates the importance of consolidating fragmented systems to improve access, usability, and overall efficiency in archival environments.

In summary, the literature reveals that despite significant advancements in digitization and metadata standards, key challenges persist in the usability, structure, and integration of online finding aids. Researchers emphasize the necessity of well-structured, intuitive, and unified platforms

that prioritize user needs through evidence-based design. This study builds on these insights by proposing a consolidated, user-centred wireframe model for online finding aids, addressing existing gaps in usability and navigation within archival web systems.

5 Methodology

This study employed a structured, three-phase methodology integrating content analysis, design thinking, and usability testing to improve the navigation and interface design of online finding aids (OFA) with a specific application to the Indian Institute of Astrophysics (IIA).

5.1 Phase I: Content Analysis of Selected Archival Institutional Websites

The first phase involved a systematic content analysis of 10 globally recognized archival institutional websites. This analysis aimed to evaluate how information was organized, categorized, and presented, with a specific focus on the effectiveness of these platforms in directing users to relevant archival content (Krippendorff 2019; Kim 2018).

A customized checklist was developed, drawing on established evaluation frameworks (Niu 2012; Madhusudhan 2012; Devi and Verma 2018), and structured into 16 thematic sections encompassing structural and functional elements. The checklist used a binary scoring system (Yes = 1, No = 0) for consistent comparative analysis. The complete checklist is provided in Appendix 1.

The archival institutions selected for analysis predominantly utilized open-source software platforms such as AtoM, ArchivesSpace, and Omeka. This consistency in technological framework ensured the applicability of findings to the IIA Archives context. Each website was evaluated using the checklist, and data was organized and analyzed using Microsoft Excel. The scoring process helped identify common design patterns and highlighted navigation-related challenges that informed the subsequent design phase.

5.2 Phase II: Design Thinking-Based Interface Development

The second phase applied a design thinking approach to develop a user-centered solution based on the content analysis findings. As Brown (2009) described, design thinking involves a non-linear, iterative process that includes the stages of empathizing with users, defining user needs, ideating solutions, prototyping, and testing.

A structured workshop was conducted with 14 participants from the Indian Institute of Astrophysics, including faculty, archivists, web designers, and researchers familiar with the Archives. In the Empathize stage, user interviews and observations were conducted to better understand user's behaviours, motivations, and challenges while accessing archival resources. The Define stage involved analyzing the gathered insights to articulate clear problem statements that guided the ideation process. During the Ideate stage, participants collaboratively generated innovative concepts for improving the interface, including strategies for streamlined navigation and integrated access to collections. These concepts were translated into visual prototypes using the Figma platform, which enabled the development of wireframes representing the proposed structure, content arrangement, and user interaction pathways (Chen et al. 2020; Nasution and Nusa 2021).

5.3 Phase III: Usability Testing with System Usability Scale (SUS)

The final phase involved evaluating the usability of the developed wireframes using the System Usability Scale (SUS), a widely used and validated tool for measuring perceived ease of use and user satisfaction (Blažica and Lewis 2015; Rina et al. 2024).

Ten participants from the Indian Institute of Astrophysics (IIA), representing potential end-users of the archival platform (e.g., researchers, scientists, and staff), were selected to evaluate the interface. The SUS questionnaire comprises 10 standardized items, each rated on a five-point Likert scale ranging from 1 (strongly disagree) to 5 (strongly agree). The scoring followed conventional SUS methodology, with raw scores converted to a composite score out of 100 based on the established formula (Lewis and Sauro 2018). This score provided a quantitative benchmark of the system's usability and informed refinements to the interface design.

By combining systematic content analysis, iterative design grounded in user input, and standardized usability testing, this methodology ensured that the proposed design solutions were evidence-based, user-centered, and contextually relevant.

6 Results and Analysis

This section presents the outcomes of the content analysis and details the application of a design thinking methodology to

address the identified usability challenges in archival websites. Section 6.1 includes the findings from content analysis, while Section 6.2 explains how user-centered design principles were applied through the five phases of design thinking.

6.1 Findings from Content Analysis

This section presents the results of the content analysis conducted on 10 archival institutional websites. The analysis highlights both the common structural features and the variations in usability practices, as well as the challenges arising from fragmented integration between institutional content and online finding aids. Together, these findings provide a comprehensive view of the current state of archival web design and form the basis for proposing an improved user-centred framework.

6.1.1 Evaluation of Selected Archival Institutional Website Features

A content analysis of 10 selected archival websites was conducted, evaluating them based on 16 key parameters to assess navigation and overall functionality. These 10 archive websites represent various cities, international organizations, institutions, and universities. Table 1 revealed that all sites (100 %) included critical elements such as a Homepage, About (History, Vision, Mission), Collections, Guidelines for Archives, Contact Us, and a Search Bar, indicating a strong commitment to user support.

However, additional features showed significant variation: 90 % of the sites included a "Services" section and "Website Terms and Use," while 80 % offered an FAQ section. Despite this general commitment to user assistance, only 70 % of the sites featured "Exhibitions" and "Blogs," and just 50 % included pages like "Archives Team," "Archives: Citation & Success," and "Contribute," revealing gaps in areas like highlighting archival staff, encouraging user contributions, and providing citation guidance.

Specific issues were identified, such as in Alberta, where the catalogue search functionality is hidden within the content while the website search bar is prominently displayed, complicating the search process. Additionally, some sites offer forms as downloadable PDFs, while others provide online submission methods or email query options, each uniquely implementing these methods. The Collections pages varied, with some sites using a single page to list all collections, while others had separate pages for sub-collections, leading to inconsistencies in information presentation. Most archives did not provide instructions on how to cite their materials.

Table 1: Key parameters for 10 selected archives website's content analysis.

Webpages	World bank	UNESCO	NCBS	Glasgow school of art	NA of India	Royal BC museum	Smithsonian institution	Alberta	Griffith institute	University of Toronto	Total	% Of page availability
Homepage	1	1	1	1	1	1	1	1	1	1	10	100
About archives	1	1	1	1	1	1	1	1	1	1	10	100
Archives team	0	1	0	1	1	0	0	0	1	1	5	50
Collections	1	1	1	1	1	1	1	1	1	1	10	100
Services	1	1	0	1	1	1	1	1	1	1	9	90
Guidelines for archives	1	1	1	1	1	1	1	1	1	1	10	100
FAQS	1	1	1	1	1	1	1	0	0	1	8	80
Website terms and use	1	1	1	1	1	1	1	1	1	0	9	90
Citation & success	1	1	1	0	0	1	1	0	0	0	5	50
Contact us	1	1	1	1	1	1	1	1	1	1	10	100
News, events, etc.	0	1	1	1	1	1	1	1	1	1	9	90
Exhibition	1	1	1	1	1	1	0	0	0	0	7	70
Blog	1	1	1	1	1	1	0	1	0	0	7	70
Online finding aids	1	1	1	1	1	1	1	1	1	1	10	100
Contribute	1	0	1	0	0	0	1	1	0	1	5	50
Social links for archives	1	0	1	1	1	1	1	1	1	1	9	90

Table 2: Integrating information for archives portal.

S. No.	Name of archives	External website	Online finding aids	Type of software system used
1	World Bank	Y	Y	CMS + OFA (ATOM)
2	UNESCO	Y	Y	CMS + OFA (ATOM)
3	NCBS	Y	Y	CMS + OFA (archives space)
4	GLASGOW	Y	Y	CMS + OFA (ATOM)
5	National archives of India	Y	Y	CMS + OFA (ATOM)
6	BC archives	Y	Y	CMS + OFA (ATOM)
7	Smithsonian Institution	Y	Y	CMS + OFA (Omeka)
8	Alberta	y	y	CMS + OFA (ATOM)
9	Griffith Institute	Y	Y	CMS + OFA (ATOM)
10	University of Toronto	Y	Y	CMS + OFA (ATOM)

While the quantitative summary in Table 1 confirms fundamental feature inclusion, the qualitative observation reveals a deeper usability challenge: the inconsistency in design logic and navigational flow often leads to user confusion. These results highlight the need for a unified approach to archival interface design that balances standard information architecture with adaptive user support systems.

6.1.2 Integration of Archival Institutional Website and Online Finding Aids System

The analysis also revealed a significant gap in integrating Archival Institute Website content information and online finding aids, which are often hosted on different pages or entirely separate websites. This disjointed structure forces users to switch platforms, leading to confusion, inefficiency, and longer search times.

Table 2 shows that, despite using sophisticated systems like AtoM (Access to Memory), ArchivesSpace, and Omeka, prominent institutions such as the World Bank, UNESCO, NCBS, Glasgow School of Art, and the National Archives of India continue to face challenges with user navigation and content accessibility. The problem is exacerbated by frequent redirections between catalogue and content pages, disrupting the user experience and making the process less intuitive.

None of the analyzed archival websites have fully integrated their content information and online finding aids into a single, seamless platform. This indicates a significant opportunity for improvement. Adopting a more cohesive web presence, where content information and finding aids are integrated, would enhance usability, streamline user interactions, and

make archival resources more accessible and discoverable, ultimately improving the overall user experience.

This disconnect between catalogues and content reflects a deeper design issue in archival systems: the lack of a user-focused approach that considers the fluidity of research practices. Addressing this gap is crucial for improving the overall functionality and scholarly utility of archival platforms.

6.2 Design Thinking: a User-Centered Framework

To address the issues identified in the content analysis, a user-centered design approach was adopted using the design thinking framework. The process followed five stages: Empathy, Define, Ideate, Prototype, and Test, each contributing to developing a functional, integrated wireframe for the proposed archival platform. A structured workshop was conducted with 14 participants, including faculty, archivists, and researchers.

6.2.1 Empathize

In the Empathy phase, user needs and challenges were explored through interviews, observations, and collaborative synthesis exercises during the workshop. Based on the feedback gathered, three primary user personas were developed: a faculty member, an archivist, and a researcher. These personas were selected to reflect the spectrum of user interactions with archival systems and to ensure that design efforts would be inclusive and relevant.

The personas' background information, goals, challenges, and system needs are outlined in Appendix 2. The insights drawn from user behavior and expectations were visually mapped into an Empathy Map, as illustrated in Figure 1. Common pain points included difficulty retrieving materials, lack of remote access guidance, and challenges navigating content pages and catalogue interfaces. These insights guided the subsequent definition of user-centric problem statements and design opportunities.

6.2.2 Define

During the Define phase, the needs articulated in the Empathize phase were synthesized into Point-of-View (POV) statements for each persona. These statements helped to crystallize the essential design challenges. As presented in Table 3, each POV statement framed a distinct usability issue and positioned it from the user's perspective, highlighting frustrations with existing archival systems.
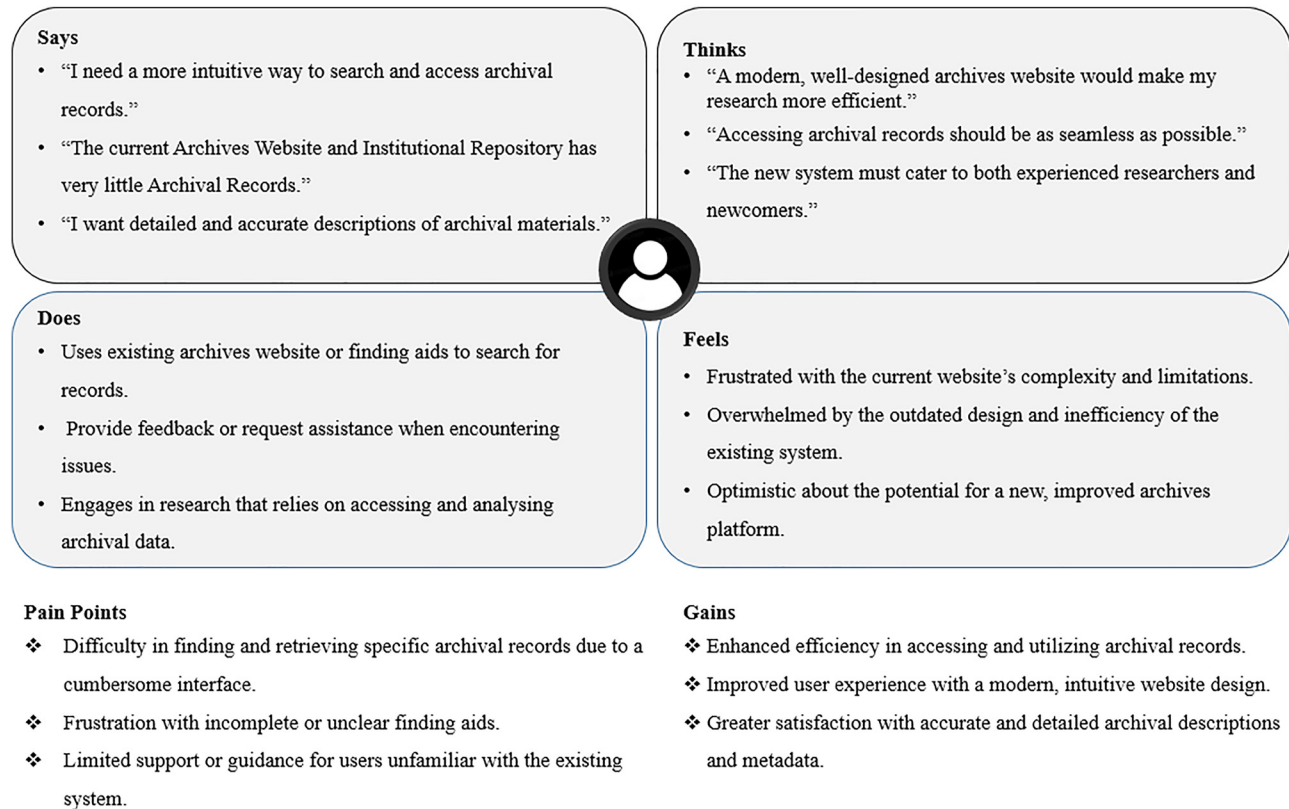
Says
- "I need a more intuitive way to search and access archival records."
- "The current Archives Website and Institutional Repository has very little Archival Records."
- "I want detailed and accurate descriptions of archival materials."

Thinks
- "A modern, well-designed archives website would make my research more efficient."
- "Accessing archival records should be as seamless as possible."
- "The new system must cater to both experienced researchers and newcomers."

Does
- Uses existing archives website or finding aids to search for records.
- Provide feedback or request assistance when encountering issues.
- Engages in research that relies on accessing and analysing archival data.

Feels
- Frustrated with the current website's complexity and limitations.
- Overwhelmed by the outdated design and inefficiency of the existing system.
- Optimistic about the potential for a new, improved archives platform.

Pain Points
- ❖ Difficulty in finding and retrieving specific archival records due to a cumbersome interface.
- ❖ Frustration with incomplete or unclear finding aids.
- ❖ Limited support or guidance for users unfamiliar with the existing system.

Gains
- ❖ Enhanced efficiency in accessing and utilizing archival records.
- ❖ Improved user experience with a modern, intuitive website design.
- ❖ Greater satisfaction with accurate and detailed archival descriptions and metadata.

Figure 1: Empathy map.

Based on these POVs, a series of "How Might We" (HMW) questions were generated to transition from problem framing to solution ideation. These questions included: "How might we simplify navigation to improve the experience for first-time users?" and "How might we better connect narrative content with searchable archival records?" These problem statements and HMW questions informed the brainstorming sessions during the ideation phase.

Table 3: Persona's point of view statement.

Persona	POV statement
Faculty members	I rely on quick and easy access to archival materials for my work. I need a well-organized and intuitive archives website to efficiently navigate and utilize the institution's rich historical and astronomical resources without being frustrated by cluttered interfaces or confusing content layouts.
Archivist	I need the IIA archives website to be accessible and well-organized. I want to efficiently find and explore valuable historical and astronomical data without struggling with outdated designs or confusing navigation.
Researcher	I need a well-organized and user-friendly IIA archives website because I want to efficiently access and analyze valuable historical and astronomical data without being hindered by outdated designs or confusing navigation.

Table 4: List of possible solutions in a single IIA archives online finding aids.

S. No.	User expectations for integrated archives portal
1	Streamlined navigation with intuitive menus and filters for quick access to archival materials
2	Advanced search engine with date, subject, and author filters for precise content access
3	User-centric interface that is visually appealing and easy to use
4	Responsive and accessible design fully compliant with WCAG 2.1 standards
5	Online exhibits and curated collections for more accessible exploration of related content
6	Multilingual support for broader audience accessibility
7	Regularly updated homepage with featured collections and dynamic content
8	Seamless integration with external databases for expanded resource access
9	User guides and tutorials for effective website use
10	Enhanced metadata and tagging for better categorisation and discovery

6.2.3 Ideate

In the ideation phase, collaborative brainstorming generated a list of potential solutions addressing the core issues identified earlier. Through a process of open discussion and group consensus, 10 key user expectations for the new archival portal were identified, as shown in Table 4. These included streamlined navigation, advanced search functionality, multilingual accessibility, responsive design in compliance with WCAG 2.1 standards, and integration with external databases.

These design priorities were intended to resolve the fragmented user experiences described during content analysis and persona development. They served as direct input for creating wireframes during the Prototype phase.
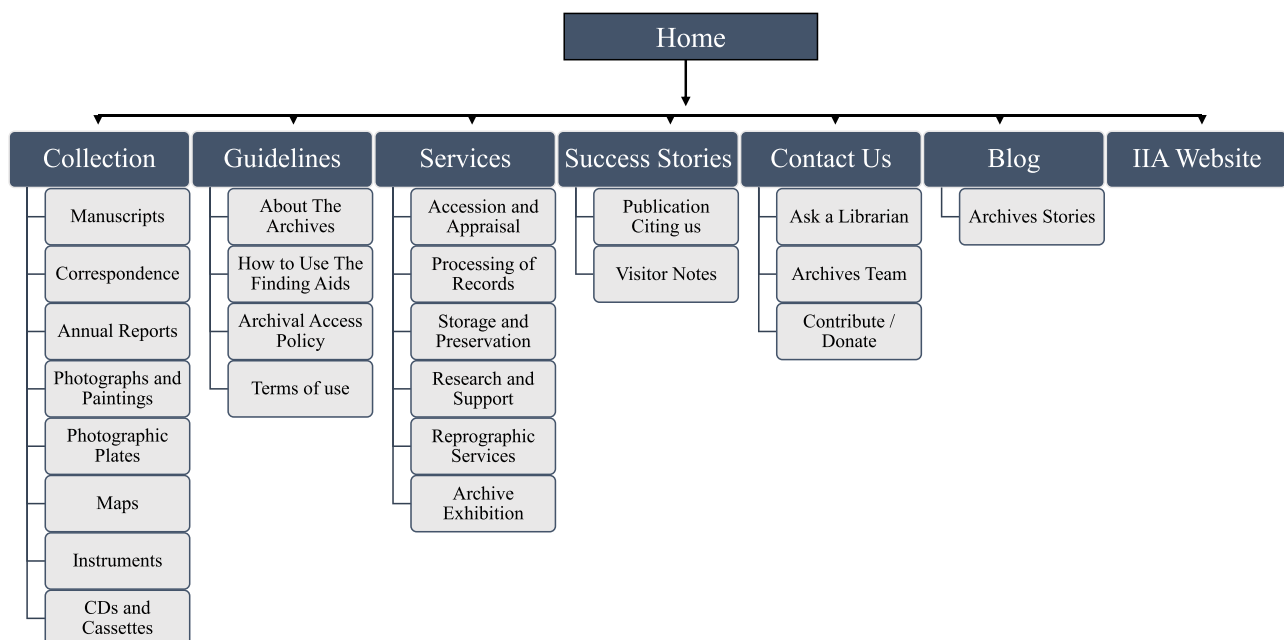
6.2.4 Prototype: Navigation Structure and Wireframe Development

The navigation structure for the integrated online finding aids was developed during the design thinking workshop. Content analysis results were presented to participants, faculty members, archivists, and researchers who prioritized features based on user needs and usability principles. The final framework ensured intuitive access to content information and finding aids within a single unified platform, addressing earlier fragmentation and usability issues. The Collections section included categories such as Manuscripts, Correspondence, Annual Reports, Photographs and Paintings, Photographic Plates, Maps, Instruments, and CDs and Cassettes for targeted exploration. Guidelines covered Archives information, Finding Aids, Access Policy, and Terms of Use. Services outlined functions like Accession and Appraisal, Record Processing, Preservation, Digitisation, Research Support, Reprographic Services, and Exhibitions. Success Stories featured Publications Citing Us and Visitors' Notes, while Contact Us enabled users to Ask a Librarian, connect with the Library Team, or Contribute/Donate. Additionally, a blog provided updates, archival stories, and a link to the IIA website for broader institutional content. The finalized navigation structure is illustrated in Figure 2. Overall, this navigation model, shaped by content analysis and participatory design, streamlines access, reduces cognitive load, and enhances usability for diverse users.

In the Prototype phase, the selected design features were translated into visual representations. Initial low-fidelity wireframes were developed in paper format to explore layout and navigation concepts (Figure 3). These wireframes were refined into high-fidelity digital prototypes using Figma, a collaborative design tool. This phase involved the participation of web designers who supported the wireframe development by implementing user-driven features into an interactive layout.

The high-fidelity prototypes (Figure 4) demonstrated both desktop and mobile views, reflecting a responsive design that

Figure 2: Navigation structure finalized during the design thinking workshop.
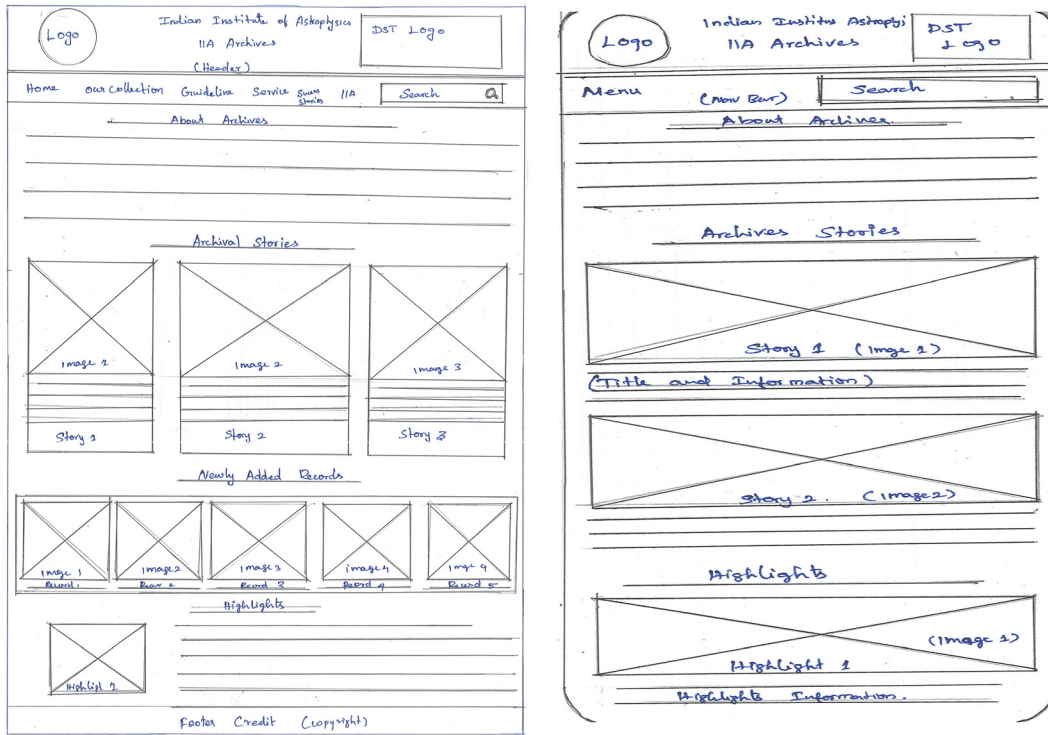
Figure 3: Paper prototype wireframe developed during the prototype phase.

Desktop View   **Mobile View**

Figure 4: Digital wireframe prototype developed in figma.

ensures accessibility across devices. These wireframes featured a clean and uncluttered interface, adhering to established usability principles to maintain visual clarity and support intuitive navigation. A central feature of the prototype was the integration of institutional content and online finding aids into a single, unified interface aimed at reducing user confusion and improving discovery efficiency.

In addition to streamlining the content catalogue relationship, the wireframe incorporated several key functionalities designed to enhance user engagement and accessibility. These included direct access to the OFA catalogue through a prominently placed search bar, intuitive navigation to archival stories that provide contextual background, a user login button, and a section dedicated to institutional archives updates. This section highlights newly added records and featured collections, ensuring users remain informed about recent developments. Collectively, these features contribute to a cohesive, user-centered platform that supports efficient information discovery and promotes an integrated and dynamic archival experience.

The prototyping process followed established design practices where wireframes function as structural blueprints (Charoenporn 2020). These diagrams enabled high-level visual planning (Garrett 2011) and incorporated a simplified, modular design structure to support usability. The merging of content and catalogue in the proposed wireframe was developed in alignment with integrated discovery principles, as Niu (2012) outlined. The wireframe is novel in its single-window integrated approach, which addresses a significant usability gap identified through content analysis. In contrast to most archival websites that rely on separate systems for their primary content management (e.g., institutional information) and Online Finding Aids (OFA) such as AtoM, ArchivesSpace, or Omeka, this design unifies both within a single, coherent platform. This consolidation eliminates the fragmented user experience typically caused by navigating across multiple interfaces. It enables seamless transitions between general archival content and detailed finding aid records, reducing user confusion and inefficiency. Moreover, the design incorporates user-centered features, including intuitive navigation, advanced search filters, multilingual support, and citation guidance. Together, these elements contribute to a cohesive, accessible, and user-friendly interface that enhances usability and improves the discoverability of archival resources (Jain et al 2019).

6.2.5 Test: Usability Testing Using System Usability Scale (SUS)

The System Usability Scale (SUS) was employed to evaluate the usability of the developed prototype. Ten participants completed the standard ten-item questionnaire (see Appendix 3), which included a mix of positively and negatively worded statements. Responses were scored according to established SUS methodology: positively framed items were scored as (x–1), while negatively framed items were scored as (5–x). The total score for each participant was then multiplied by 2.5 to derive an individual sub-score, producing a final usability score ranging from 0 to 100.

Participant responses were compiled, and total scores were used to calculate individual sub-scores. The aggregated results, presented in Table 5, yielded an average SUS score of 84, placing the prototype firmly within the "excellent" usability category (Lewis and Sauro 2018). While most participants provided scores in the excellent range (80–92.5), a few participants scored slightly lower, between 70 and 77.5. These minor variations may reflect differences in prior experience with similar digital systems, personal interaction preferences, or momentary task-related challenges.

Table 5: SUS evaluation results and usability score summary.

Users	P1 (x−1)	P2 (5−x)	P3 (x−1)	P4 (5−x)	P5 (x−1)	P6 (5−x)	P7 (x−1)	P8 (5−x)	P9 (x−1)	P10 (5−x)	Total points (ΣS)	Sub-score (points X 2.5)
R1	3	4	4	4	4	4	3	4	3	4	37	92.5
R2	4	3	4	3	4	3	4	3	4	2	34	85
R3	3	3	3	3	3	2	3	3	2	3	28	70
R4	4	4	4	3	4	3	4	3	3	3	35	87.5
R5	3	3	4	3	4	3	3	3	4	2	32	80
R6	4	3	4	3	4	3	3	4	3	2	33	82.5
R7	4	3	4	3	4	4	4	3	4	2	35	87.5
R8	3	3	3	4	3	3	3	3	3	3	31	77.5
R9	4	4	4	4	4	3	4	4	3	3	37	92.5
R10	4	3	4	3	4	3	3	4	4	2	34	85
SUS score												84

Figure 5: SUS scorecard.

Nonetheless, all participants rated the system above the threshold for acceptable usability, confirming that the platform is consistently user-friendly and effective across diverse users.

The high SUS score demonstrates that the prototype is intuitive, easy to navigate, and consistent in interaction design. Participants reported confidence in retrieving information and satisfaction with the integrated search structure. These results validate the design decision to unify institutional content with online finding aids, effectively addressing the usability challenges identified during content analysis and persona development.

A SUS score above 80 also has broader implications, predicting not only strong user satisfaction but also a high likelihood of continued adoption and recommendation (Lewis and Sauro 2018). In the context of archival systems, where user trust, engagement, and accessibility are critical, this finding underscores the potential of the proposed platform to support sustainable scholarly interaction and efficient information retrieval.

As shown in Figure 5, this high usability rating validated the success of the user-centered design process. Participants reported ease of navigation, confidence in use, and satisfaction with the integrated search structure. These results demonstrate that the design addressed the most pressing usability challenges identified during the content analysis and persona development phases, resulting in a cohesive, reliable, and highly user-friendly system.

7 Discussion

This study investigated the usability challenges of Online Finding Aids (OFA) and archival websites by integrating content analysis with a structured design thinking methodology. The content analysis of 10 archival websites revealed that while foundational features such as Homepages, About sections, Collections, Contact information, and Search bars were consistently implemented, advanced user-support features showed significant inconsistencies. Features like citation guidelines, team listings, and contribution pages were present in only half of the websites, indicating a broader issue where archival portals prioritize basic informational structures while neglecting functionalities that promote deeper user engagement and interactivity. These findings align with previous studies highlighting similar gaps in archival user experiences (Al-Qallaf and Ridha 2018; Toms and Duff 2002). A critical usability challenge identified was the persistent disconnection between content information and catalogue platforms. Despite institutions adopting advanced archival management systems such as AtoM, ArchivesSpace, and Omeka, the platforms often presented fragmented pathways to archival materials. Users were required to navigate between standalone catalogue systems and separate content pages, sometimes hosted on different servers or subdomains. This structural separation complicated the search process, diminished usability, and reduced the overall efficiency of archival research. These observations support prior research identifying disconnected digital platforms as a core obstacle to archival accessibility and user satisfaction (Thorpe 2024; Niu 2012).

The study adopted a user-centered design thinking approach to address these challenges, following the five phases of Empathy, Define, Ideate, Prototype, and Test. The development of three user personas – faculty members, archivists, and researchers – ensured that the design process remained grounded in real-world scenarios and diverse user needs. Empathy mapping and point-of-view statements

crystallized core user frustrations, such as difficulties locating materials, navigating multiple disconnected systems, and lacking intuitive website structures. "How Might We" statements derived during the Define phase facilitated targeted solution ideation. Collaborative brainstorming sessions identified 10 key user expectations for an improved archival portal, including streamlined navigation, advanced search functionalities, multilingual accessibility, responsive and WCAG-compliant design, and seamless integration of catalogue and content systems. These design priorities addressed the structural and experiential challenges highlighted during content analysis. During the Prototype phase, solutions were translated into low- and high-fidelity wireframes using Figma. These prototypes demonstrated a single-window integrated platform, seamlessly combining content information and finding aids to improve logical flow and reduce user confusion. The design adhered to established information architecture and usability principles (Garrett 2011; Charoenporn 2020), prioritizing clarity, accessibility, and user satisfaction. Unlike existing archival websites that maintain separate CMS and finding aid systems, this unified approach enables smooth transitions between general information and detailed records. By eliminating fragmented structures, it offers a cohesive, user-friendly interface that enhances overall usability and discoverability of archival resources.

Usability testing using the System Usability Scale (SUS) validated the effectiveness of this user-centered design. An average SUS score of 84 placed the prototype in the "excellent" category (Lewis and Sauro 2018), with participants reporting ease of navigation, improved confidence in accessing archival materials, and satisfaction with the integrated search structure. These results underscore the value of incorporating user perspectives into archival system design to resolve real-world usability challenges effectively. Overall, this study demonstrates that combining content analysis with design thinking offers a robust framework for enhancing the usability of online archival finding aids. The results advocate a shift towards integrated, user-centered archival platforms that prioritize intuitive navigation, seamless content-catalogue integration, and features that actively support research practices, ultimately contributing to improved accessibility, discoverability, and scholarly engagement with archival resources.

8 Conclusion and Future Study

This study demonstrated the effectiveness of combining content analysis with design thinking to enhance the usability of Integrated Online Finding Aids (OFA). Evaluation of 10 archival websites revealed that while foundational elements such as Homepages, Guidelines, and Search functions were consistently present, advanced features like archival records citation guidance and donation guidance were often lacking or inconsistently implemented. A major challenge identified was the fragmented architecture separating institutional content information from online finding aids systems, complicating user navigation and increasing search complexity (Dewiyana 2021; Thorpe 2024).

To address these challenges, a design thinking framework was applied, resulting in a user-centred wireframe for an integrated OFA platform. This approach incorporated empathy-driven insights to address core user pain points and improve accessibility (Nasution and Nusa 2021). The wireframe was developed using Figma, whose collaborative features enhanced design consistency and fidelity (Santoso 2024). Using AtoM as both the content management system (CMS) and cataloguing tool eliminated external CMS dependencies and minimized user redirection, enabling a cohesive browsing experience. Implementing such an integrated OFA wireframe can significantly improve navigation, accessibility, and overall user experience, making archival resources more readily available to broader audiences (Pitol 2019; Davis 2012).

Usability testing with 10 participants produced a SUS score of 84, exceeding the standard benchmark of 70 and indicating high user satisfaction with performance, discoverability, and interaction design (Lewis and Sauro 2018). These findings align with existing scholarship emphasizing the importance of seamless navigation and integrated access in archival interfaces (Jaillant et al. 2022) and demonstrate that design thinking effectively produces user-centered designs prioritizing usability and satisfaction (Chen 2019).

However, this study has limitations. The usability evaluation involved only 10 participants, which may not represent the full diversity of archival users, and testing was conducted in a pre-implementation environment without longitudinal data. Future research should expand usability testing to larger and more diverse user groups and conduct longitudinal studies to assess long-term user engagement, behavioral adaptation, and system effectiveness post-implementation.

Additionally, future studies should focus on directly integrating content management features within OFA systems to reduce reliance on external CMS platforms. Implementing such integrated designs at the Indian Institute of Astrophysics (IIA) using open-source OFA tools like AtoM can serve as scalable models for other institutions. Comprehensive documentation of tool selection, customization, testing, and launch phases will further facilitate refinement

and contribute significantly to the evolution of integrated online finding aids that effectively meet user needs while leveraging technological advancements.

Appendix

Appendix 1 Checklist for Content Analysis of Ten Selected Archives websites.

Section	Checklist item	Yes (1)	No (0)
Homepage	Clear navigation to all major sections (e.g., archives, collections)		
	Introductory overview of available finding aids		
	Easy access to collections		
About archives	Brief history or background of the archives		
	Description of materials held		
	Mission or purpose of the archive		
Archives team	Team members listed with brief biographies		
	Contact information for team members available		
Collections	Collections listed with relevant metadata (title, creator, date range)		
	Clear and accurate collection descriptions		
	Search function for collections		
Services	Outline of services offered (e.g., access, digitization, research assistance)		
	User-friendly explanations of services		
Guidelines for archives	Clear guidelines for accessing and using archives		
	Restrictions or permissions mentioned		
	Instructions for contributing materials or requests		
FAQS	Clear answers to common questions about finding aids and archives		
	Search function for FAQs		
Website terms and use	Clear statement of terms and conditions		
	Highlight intellectual property, data usage, and privacy		
Citation & success	Citation guidelines provided		
	Format for referencing archives and materials		

(continued)

Section	Checklist item	Yes (1)	No (0)
	Notable archive achievements or successes included		
Contact us	Accessible contact form or email address		
	Social media links provided		
News, events, etc.	Updates on recent news and events		
Exhibition	Current and past exhibitions highlighted		
	Digital access to exhibition content (if available)		
Blog	Insightful posts related to archives		
	Categorized posts for easy navigation		
Online finding aids (OFA)	Organized by collection, subject, or format		
	Search function with filtering options		
	Metadata displayed (title, creator, date, location)		
Contribute	Clear process for contributing materials		
	Guidelines on accepted materials		
	Submission form or contact information for contributions		
Social links for archives	Functional social media links (e.g., Facebook, twitter, instagram)		

Appendix 2 Personas that Have Been Identified during the Empathy Phase of Our Research.

Persona	Faculty members	Archivists	Researcher
Background	A faculty member involved in astronomy-related research, specializing in astrophysics or planetary science	A professional managing and maintaining archival collections, including digitization and user access	An independent or affiliated researcher conducting astronomy or astrophysics studies using archives
Goals	– Leverage archival resources for research – Publish findings in top journals – Stay updated with technological advancements – Mentor future astronomers	– Facilitate access to archival records for diverse user groups – Ensure accurate metadata and preservation standards – Enhance user experience through	– Access and utilize archival records for independent or institutional research – Integrate archival data into academic studies

(continued)

Persona	Faculty members	Archivists	Researcher
Challenges	– Complexity in the current physical arrangement of archives – Difficulty in understanding and retrieving archival records	improved systems – Managing disconnected systems and workflows – Difficulty assisting users due to system limitations or lack of integration	– Unable to visit the archives in person due to distance – Difficulty in accessing and retrieving archival records remotely
Needs	– Efficient access to and utilization of archival records for teaching and research – Improved connectivity and integration with archival systems	– Streamlined management tools and integrated backend – User-friendly platform that supports remote access and institutional collaboration	– Remote access to archival records – Effective digital tools and support for engaging with archival collections

Appendix 3 User Statements for SUS Evaluation.

S. No.	Statement
1	I believe I will use this website regularly.
2	I find this website to be overly complex and in need of simplification.
3	I think this website is easy to navigate.
4	I feel I need technical assistance to navigate this website.
5	I find that the website's navigation is intuitive and easy to follow.
6	I encountered many inconsistencies in the website's navigation.
7	I believe most users can learn to navigate this website quickly.
8	I find this website very difficult to navigate.
9	I am confident in my ability to use this website effectively.
10	I need to learn a lot before I can navigate this website correctly.

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