

**Needs Analysis For Managing Historical Collections As A Challenge In
Providing Effective Information Retrieval Tools**

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ABSTRACT

Museums play an important role in preserving the nation's cultural and historical heritage. However, many museums in Indonesia, particularly in West Sumatra, still face serious challenges in providing effective systems for searching collection information. These challenges stem from limitations in information presentation, infrastructure, and technology, all of which affect the quality of visitors' experiences in understanding the historical and cultural value of exhibited collections. This study aims to analyze the needs involved in managing historical collections, with a focus on the initial stage of Design Thinking—empathize—in order to understand the needs of museum managers and visitors for a responsive and informative retrieval system. Using field observations, interviews, and surveys conducted in several popular museums in West Sumatra, the study explores visitors' expectations regarding interactive and in-depth access to information. The findings indicate that most visitors, especially younger generations, expect more innovative retrieval tools, such as digital catalogs and mobile applications, capable of providing additional information on historical context, cultural value, and the unique stories associated with each collection. In addition, the Design Thinking approach proved relevant for designing empathy-based solutions centered on user experience, enabling museums to optimize their educational function. The results are expected to contribute to the development of effective and interactive tools for information search and retrieval, thereby supporting museums in fulfilling their role as relevant centers of education and cultural preservation in the digital era.

Keywords: *museum, design thinking, information retrieval, digital historical collections*

INTRODUCTION

Museums play a strategic role in preserving the cultural wealth and historical legacy of a nation (Perera, 2013). In Indonesia, museums are recognized as formal institutions that function as educational centers providing public understanding of cultural values, as stipulated in Government Regulation No. 66 of 2015 concerning Museums. Nevertheless, a number of museums in Indonesia, especially in West Sumatra, still face substantial challenges in providing effective information retrieval systems for the collections they exhibit. As a consequence, museum visits are often less than optimal, particularly for younger visitors who need more than visual display alone and seek richer connections with historical and cultural objects.

This challenge in collection management is evident from field observations conducted at Museum Adityawarman, the Minangkabau Cultural Documentation and Information Center Museum (PDIKM), Istan Basa Pagaruyuang Museum, and several museums in Sawahlunto. Observations, interviews, and surveys in these museums revealed that valuable collections—such as inscriptions, Minangkabau historical artifacts, and visual documentation—are often accompanied only by brief descriptions and display arrangements. An interview with one museum manager indicated that the existing collection retrieval process still requires further development in documentation and information systems. Other collections are likewise not supported by comprehensive information, limiting visitors' understanding of the historical context and value embodied in the objects.

Conditions found in the field reveal a gap between the role of museums as mandated by regulation and the actual use of museum collections as sources of history and culture. In the current digital era, public expectations of museums extend beyond visual presentation toward deep educational experiences. According to the International Council of Museums (2020), museums should adopt comprehensive policies to provide information that is complete, accurate, and easy to understand. However, limitations in information technology, infrastructure, and human resources mean that many museums in Indonesia, particularly in West Sumatra, have not yet been able to meet this standard consistently, including in terms of the uniformity of collection retrieval tools across museums.

In information retrieval theory, effective searching is strongly influenced by the degree to which information is organized, documented, and presented to users (Marrara et al., 2017). Kuhlthau (2018) and Marchionini (1995) describe information retrieval as a cognitive process involving interaction between users and systems to locate relevant information. In the museum context, retrieval tools are key determinants of the quality of visitor interaction with exhibited collections (Nabillah et al., 2024). Effective retrieval enables

visitors not merely to see objects, but also to understand the cultural and historical contexts that accompany them.

Pirolli (2007) Information Foraging Theory explains that users tend to seek information that offers high value or relevance to their goals. In museums, visitors do not simply come to observe artifacts; they also seek deeper insights that can enrich their historical understanding (Mirjaz & Abioso, 2024). Museums that fail to provide information aligned with these needs risk losing visitor interest, especially among younger generations who generally have higher expectations regarding technology-based interaction (Ibrahim et al., 2021). These demands have become more urgent as museums are increasingly expected to function as technologically enhanced centers of cultural interaction.

At the national level, the preservation of culture and history has become a strategic issue as the government encourages museums to serve as centers of education and recreation (Mohamad et al., 2024). However, limited funding and shortages of competent human resources remain major obstacles to developing modern information retrieval systems (Quaosar & Rahman, 2021). Previous studies indicate that technological limitations and a lack of innovation are among the main barriers preventing Indonesian museums from providing visitors with rich educational experiences (Puspasari & Hidayanto, 2023). Initial surveys in several museums in West Sumatra reveal the same condition.

A preliminary survey conducted at the Bukittinggi Museum showed that most visitors, especially younger visitors, expected access to additional information such as interactive maps, educational videos, and easily accessible digital catalogs. Follow-up surveys at the PDIKM Museum similarly found that some visitors considered their experience unsatisfactory because of the lack of contextual information needed to understand the historical value of the displayed collections. Interviews with museum managers further revealed that collections documenting Minangkabau history and culture are largely presented in static formats, causing visitors to understand the information only superficially and raising concerns that the museum may eventually lose its educational appeal.

Managers of Istano Basa Pagaruyuang Museum reported a 15% decline in visitor numbers in 2022, with many visitors identifying limited access to information and monotonous displays as primary reasons for reduced interest. This decline points to an urgent need for museums to improve the provision of information retrieval tools. Visitors need richer information to establish emotional connections with exhibited collections (Veronica et al., 2023). Surveys in several museums in Sawahlunto, which present the history of mining during the Dutch colonial era, found similar challenges. At the Goedang Ransoem Museum, for example, interviews with managers showed

that key collections such as mining equipment and archival photographs are accompanied only by brief descriptions without deeper explanations, leading many visitors to leave without a clear understanding of the significance of the collections (Murdiastomo et al., 2023).

For this reason, Design Thinking can be applied as an approach to understanding visitor needs in this study. The research focuses on the first of the seven stages of Design Thinking, namely empathize, with the aim of understanding users' needs and perspectives in depth before designing relevant solutions. This empathize stage serves as the foundation for analyzing information retrieval needs in accordance with the expectations of museum visitors and managers. Through interviews, surveys, and direct observation, the study seeks to comprehensively identify visitors' information preferences. Such understanding is expected to provide a strong basis for developing retrieval tools that are truly responsive to visitor needs and aligned with international standards of museum management.

As lecturers in the Library and Information Science program with a focus on information and data management, the researchers and their team are in a strategic position to identify and formulate practical solutions to this challenge. Drawing on a strong understanding of information retrieval theory, the research team aims to develop a retrieval model that not only improves information accessibility for visitors but also aligns with standards for museum collection management. This study is not limited to offering technical recommendations; it also constitutes a form of academic collaboration with cultural institutions in creating innovations in information management that respond to public needs. Such collaboration is relevant as part of broader efforts to strengthen partnerships between educational institutions and cultural organizations in improving museum management. Through empathy-based needs mapping, this study is expected to offer concrete solutions to the challenges of managing museum collections in Indonesia. Innovation in retrieval tools is expected to improve the quality of visitor interaction with museum collections while reinforcing museums' role as centers of education and cultural preservation.

LITERATURE REVIEW

Museums are important institutions in preserving a nation's culture and history (Yasmin et al., 2017). According to the International Council of Museums (2022), a museum is an institution that preserves collections for educational purposes and the safeguarding of historical heritage. Although this definition has been revised several times since 1946, it consistently affirms the importance of museums in preserving historical artifacts. In Indonesia, museums function as educational centers under PP No. 66 of 2015 which stipulates that museums must develop, protect, and utilize collections.

Effective information retrieval is strongly influenced by how data are organized and presented to users (Onwuchekwa & Jegede, 2011). Marchionini (1995) explains that retrieval is a cognitive process involving interaction between users and systems. In the museum context, retrieval tools serve as primary media connecting visitors with information about displayed collections (Koukoulis et al., 2022; Reitstätter et al., 2022). When retrieval systems provide complete and well-structured information, visitors are better able to understand the cultural and historical value of the collections they encounter (Jin & Liu, 2022).

Information Foraging Theory, proposed by Pirolli and Card (1999), suggests that users tend to search for information that closely matches their needs. Museum visitors do not merely observe artifacts visually; they also want deeper insights into the historical context and significance of the objects. This indicates the need for museums to provide effective retrieval tools with comprehensive information so that visitors can gain meaningful understanding.

Collection management is also grounded in theories that emphasize acquisition, documentation, conservation, and effective presentation of collections (Mudawamah, 2021; Robbins, 2017). Adequate documentation is essential for preserving the authenticity and historical record of each artifact (Ehteshami & Soltaninejad, 2020; Patrick-Burns, 2015). ICOM underscores that documentation forms part of a museum's responsibility to provide optimal public access to information (Li, 2024). In practice, this process includes inventorying and registration, which help museum managers compile catalogs and more systematic retrieval tools (Goskar, 2024).

In terms of documentation, previous studies show that museums in Indonesia often remain limited in providing comprehensive access to information. Fithriah and Najmi (2020) note that museums in West Sumatra face obstacles in presenting collection data that are minimal and unappealing, which reduces visitors' interest in exploring the available information. Technology-based retrieval is one potential solution that can enrich visitors' experiences through interactive digital catalog systems (Tesoriero et al., 2014). Collection administration is equally relevant because each collection should have detailed records covering physical description, provenance, and object history. In traditional museums such as those in West Sumatra, this theoretical perspective can guide improvements in the quality of information provided to visitors.

In line with technological development, digital information retrieval theory is increasingly applied in modern museums (Wu et al., 2022). Museums can develop digital catalog systems or mobile applications that enable more interactive exploration of collections (Puspasari, 2020). This corresponds with visitors' expectations for easy access to information through

technology, especially among younger generations who are more familiar with digital devices. Research by Ardiwidjaja and Antariksa (2022) on the Archaeological Museum in Bali shows that the use of information technology in museums remains limited, affecting visitor numbers and public interest. Museums in Indonesia still often rely on physical displays without adequate information systems, even though technology can enrich visitor experiences and strengthen museums' appeal as educational tourism destinations.

Previous studies also reveal that one of the main challenges in Indonesian museum management is the limited availability of human resources competent in collection management. Alexander (2015) argues that resource limitations, including insufficient training for curators, affect the quality of information that can be presented. This issue has become increasingly urgent, given the need for well-documented collections to improve accessibility.

This review indicates that the development of museum information retrieval systems requires a structured approach, beginning with comprehensive documentation and extending to the use of digital technology. Accordingly, the present study aims to formulate practical solutions to the challenges of managing historical collections in museums through a Design Thinking approach focused on visitor needs. This theoretical foundation underpins the study's analysis of needs in historical collection management, particularly in relation to the provision of more effective and interactive information retrieval tools for museum visitors.

RESEARCH METHODS

Design Thinking is considered relevant for the development of museum information retrieval systems. Brown (2009) describes Design Thinking as a creative method that emphasizes empathy for user needs. The approach consists of several stages: empathize, define, ideate, prototype, test, implement, and iterate. In the museum context, the empathize stage is especially important for understanding visitors' needs related to collection information so that the retrieval system developed is genuinely aligned with user expectations.

This study applies the Design Thinking method with a specific focus on the first stage, empathize, in order to gain an in-depth understanding of museum visitors' needs and preferences regarding an effective retrieval system for historical collection information. By adopting this approach, the study aims to obtain insights into the expectations and experiences of museum visitors in West Sumatra so that relevant and user-centered retrieval solutions can be developed.

The study employs field observation, in-depth interviews, and surveys as the main data collection techniques. It is further supported by additional

methodological components that strengthen the accuracy and analytical sharpness of the findings. A qualitative approach is used to understand the experiences and needs of museum visitors and managers in accessing information on historical collections. Research participants consisted of museum visitors and managers selected purposively according to criteria such as frequency of visits and direct involvement in collection management.

The research sites include Museum Adityawarman, the Minangkabau Cultural Documentation and Information Center Museum (PDIKM), and Istana Basa Pagaruyuang Museum in West Sumatra. These museums were selected because of the diversity of their collections, which are closely related to Minangkabau culture and history and are considered representative of collection-management issues and the need for rich visitor information.

Data obtained from observations, interviews, and surveys were analyzed thematically using qualitative analysis techniques. First, field notes and interview transcripts were examined carefully to identify major themes such as information needs, preferences for retrieval media, and perceived barriers. The data were then grouped into relevant categories, including perceptions, constraints, and expectations concerning information retrieval systems. Survey findings were integrated with interview results to provide a comprehensive picture of visitor needs that can serve as the basis for developing retrieval tools better suited to users. The focus on the empathize stage is expected to reveal the needs of museum visitors in accessing historical collection information and to provide a strong basis for the development of retrieval systems that correspond to user expectations and requirements.

RESULTS AND DISCUSSION

This study found that museums in West Sumatra face significant challenges in providing collection information that is adequate and easily accessible to visitors. Based on interviews and observations, most visitors stated that museum information is generally limited to brief labels without in-depth historical or cultural context. According to Marchionini (1995) theory of information retrieval, effective access requires sufficient structure to connect users with the context they seek. Therefore, the need for richer information becomes crucial if museums are to meet visitors' expectations regarding the historical and cultural value of displayed collections.

Visitors from younger generations showed a strong preference for interactive digital retrieval systems. Approximately 75% of respondents preferred digital catalogs accessible through mobile devices or web-based applications. Previous research has shown that information technology in museums can enrich visitor experience (Fithriah & Najmi, 2019). These findings indicate that technologies such as interactive applications or mobile platforms can increase visitor satisfaction and broaden access to relevant information about museum collections.

Field research also revealed that visitors frequently encounter difficulties in accessing specific information about collections they are interested in. They often rely on museum staff or guides, who are not always available. The absence of digital catalogs or adequate retrieval systems hinders visitor interaction with collections, which is consistent with Information Foraging Theory, according to which users prefer information that is easy to access (Pirolli & Card, 1999). These limitations risk weakening museums' attractiveness as educational institutions.

Interview results further showed that many visitors want information to be presented in the form of narratives or engaging stories that reveal the unique history of each collection. Personalized narratives can provide emotional experiences and foster personal connections between visitors and exhibited objects. Information retrieval theory suggests that contextualization is essential for increasing user interest and engagement (Alexander, 2015). Consequently, narrative or storytelling features would strongly support the educational function of museums and enhance visitor satisfaction.

Visitors also expected higher visual quality in the presentation of collections, for example through high-resolution images or 3D models. Some visitors at Museum Adityawarman expressed interest in seeing more detailed views of inscriptions and ancient artifacts. Previous research has shown that visual technologies in museums can clarify information and improve user experience (Wirata, 2012). Rich visual access allows visitors to understand the unique details of each collection, thereby deepening their knowledge of

local history and culture.

Survey findings indicate that visitors expect retrieval systems to be intuitive and well structured, allowing information to be accessed through categories such as year of origin, provenance, and object type. Such grouping aligns with classification theory, which helps users understand relationships among collections (Marchionini, 1995). A system of this kind would greatly assist visitors in navigating collections relevant to their interests without depending on direct assistance from museum staff.

On the other hand, interviews with museum managers revealed considerable obstacles to providing adequate information systems. Managers identified limited budgets and insufficient technological infrastructure as the main barriers to developing digital catalogs or mobile applications desired by visitors. Literature reviews similarly identify financial constraints as one of the major barriers to information-system development in museums (Alexander, 2015). This points to the need for more affordable and more easily implementable solutions for regional museums.

Museum managers also reported limited training opportunities for human resources in digital collection management. This lack of competence aggravates the problem of incomplete and poorly structured collection documentation. According to standards issued by the International Council of Museums (2020), effective documentation and collection management are essential aspects of museum functions. Therefore, training for curators and museum staff is a critical factor in improving the quality of museum information retrieval systems.

The use of the empathize stage in this study produced a deep understanding of visitor needs and preferences, especially regarding information openness and technological access. This stage is consistent with Design Thinking theory, which prioritizes understanding users before developing solutions (Brown, 2009). The findings provide a strong basis for designing user-centered retrieval tools so that museums can perform their educational role more effectively in the digital era.

The study also demonstrates a clear gap between visitor needs and current conditions. Many visitors expect more interactive experiences, while limitations in technology and documentation restrict such possibilities. This gap suggests the need for collaboration between government agencies and cultural institutions to support the development of information technology in museums, especially those located in regions with limited financial resources.

As an implication of these findings, this study recommends improving human-resource capacity, particularly in museum information management and technology. Adequate training is expected to improve collection documentation and strengthen the information systems desired by visitors. This recommendation is consistent with ICOM guidelines on collection

management, which encourage museums to employ trained staff capable of managing data and information technologies required for public service.

Overall, the findings reveal substantial potential for improving visitor experiences in museums through more responsive and technology-based retrieval systems. These results provide a foundation for the development of tools that will support museums in fulfilling their educational functions and meeting growing visitor expectations for digital information access. In this way, the study is expected to encourage innovation in collection management and information services in Indonesian museums.

CONCLUSION

The empathize stage of this study reveals that museums in West Sumatra face major challenges in providing in-depth and easily accessible information about their historical collections. Based on interviews, surveys, and observations, the study found that visitors—especially younger generations—expect interactive digital retrieval systems capable of providing richer and more informative learning experiences. The limited information currently available on collection labels is insufficient to meet visitors' needs for contextual information such as historical background, cultural value, and the unique stories associated with each collection.

The findings also show visitors' preference for the use of technology in information presentation, such as digital catalogs or interactive applications accessible through mobile devices. In addition, the study points to the need for improved visual presentation of collections, including high-resolution images or 3D models, to help visitors understand the unique details of each object. At the same time, museum managers face constraints related to limited budgets, technological infrastructure, and training for human resources, all of which constitute major barriers to meeting visitor information needs adequately.

Overall, this stage of the research demonstrates the importance of innovation in museum information retrieval systems. Developing systems that respond directly to user needs, as emphasized in the Design Thinking approach, can improve the quality of visitor interaction with museum collections and support the museum's educational function. These findings provide a strong basis for the development of more interactive and technology-based retrieval solutions so that museums can perform more effectively as centers of historical preservation and cultural education.

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