

# Optimizing Display Design to Enhance Visual Experience at Sintuk War Museum

Fauziyah Afni<sup>1)\*</sup>, Della Oktavinoarti<sup>2)</sup>, Intan Tursina<sup>3)</sup>

<sup>1,2,3)</sup> Visual Communication, Faculty of Creative Technology and Economics, Universitas Awal Bros, Indonesia

\*Corresponding Author

Email : [fauziyahafni2504@gmail.com](mailto:fauziyahafni2504@gmail.com)

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## ABSTRACT

The Sintuk War Museum in Padang Pariaman Regency plays a crucial role in preserving and disseminating the narrative of local historical struggles. However, the utilization of the museum's interior, particularly its display system, has not been optimized, resulting in limited visual readability, inadequate collection grouping, and a diminished visitor experience. This study seeks to optimize the museum display design to enhance the quality of visual presentation and visitors' comprehension of historical content. This research employs a design thinking approach comprising five stages: empathize, define, ideate, prototype, and test. Data were collected through direct observation, interviews with museum management, visual analysis of the exhibition space, and a literature review pertaining to museum display design. The collected data were analyzed using SWOT analysis to identify strengths, weaknesses, opportunities, and threats as the foundation for design development. The study generated several alternative display design concepts, which were subsequently evaluated through prototyping and user feedback. The selected display design prioritizes visual clarity, efficient space utilization, collection safety, and the reinforcement of historical narratives through focused lighting and systematic object grouping. The proposed design is anticipated to enhance visitors' focus, comfort, and comprehension of the exhibited collections. This study provides design recommendations that integrate aesthetic, functional, and educational aspects, rendering them pertinent for the development of display systems in historical museums with comparable characteristics.

## KEYWORDS

Design , Display, Visual Experience, Sintuk, War Museum

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## INTRODUCTION

Indonesia possesses a rich cultural diversity that functions as a national identity as well as a framework for social life. Culture serves as a bridge between individuals and their social and historical environments. Therefore, changes in or the loss of cultural elements may weaken the collective identity of a community. Consequently, cultural preservation efforts should not be limited to the physical protection of artifacts alone, but must also emphasize the strengthening of cultural understanding through communicative and contextual educational media (Purba et al., 2025).

Museums hold a strategic role in maintaining cultural and historical continuity. In addition to functioning as spaces for storage and conservation, museums have evolved into centers of education and public communication that disseminate historical values to a broader audience. The effectiveness of a museum in fulfilling its educational function is largely determined by how information and collections are presented to visitors (Wulandari et al., 2017). A well-designed exhibition space enables visitors to understand historical messages more effectively through organized circulation, appropriate lighting, and a structured display system.

In the context of museum education, display design functions not merely as a means of placing

exhibited objects but also as a visual communication medium that constructs narratives, clarifies information, and enriches visitors' learning experiences. Previous studies have shown that object layout, lighting, color schemes, and the use of visual media significantly influence visitors' interest, visual comfort, and level of understanding (Kusuma et al., 2025). Conversely, a poorly organized display system can hinder message delivery and reduce the effectiveness of the exhibition as an educational medium (Khoirunnisa, et al., 2019)

One of the museums that plays an important role in preserving local history is the Museum Perang Sintuk, located in Padang Pariaman Regency, West Sumatra. The museum was established to preserve the collective memory of the local community's struggle against colonialism through historical artifacts and visual documentation. However, observations conducted on May 1, 2024, indicate that the presentation of collections at the museum is not yet supported by an optimal display system and adequate informational media. As a result, the museum's educational potential has not been fully conveyed to visitors.

In line with modern curatorial principles, museum display design should be able to construct a clear narrative flow, effectively integrate visual elements, and create an informative and immersive exhibition experience (Zakiah et al., 2025). Therefore, this study positions the optimization of display design at the Museum Perang Sintuk as a novel approach that not only enhances visitors' visual experience but also strengthens the museum's educational function as a center for preserving local historical and cultural heritage.

## METHOD

The research and design process employed a design thinking approach consisting of five stages. This approach enables the integration of multiple perspectives and the development of solutions oriented toward users' needs and experiences. The implementation of design thinking began with an in-depth understanding of users' needs and expectations (empathize), followed by a clear problem formulation that became the focus of the display design strategy for the Museum Perang Sintuk (define). The next stage involved generating creative ideas to formulate design strategies (ideate), which were then translated into prototypes or proposed design solutions (prototype). The final stage included testing and evaluating the developed prototypes (test) to ensure their alignment with the identified needs and the overall objectives of the research (Subianto et al., 2024).

Data were collected through observation, interviews, and literature review. The observations focused on the physical condition of the interior space and the existing display system at the Museum Perang Sintuk. Interviews were conducted with relevant museum stakeholders to gain a deeper understanding of existing conditions, needs, and challenges. The literature review was used to gather theoretical and empirical references relevant to this study. Data analysis was carried out using SWOT analysis by constructing a matrix that positioned external factors on the vertical axis and internal factors on the horizontal axis. The results of this matrix were used to determine appropriate design strategies by integrating the identified factors to achieve an optimal display design (Soewardikoen, 2019).

## RESULT AND DISCUSSION

This section presents the research findings based on the stages of the design thinking method, namely empathize, define, ideate, prototype, and test. Each stage is systematically described to explain the field findings obtained through observation and interviews. These findings are then analyzed with reference to visual communication design theory, human-centered design, and contemporary museum studies to strengthen the scholarly interpretation of the results. The design thinking approach is employed because it emphasizes a user-centered design process (human-centered design), ensuring that the proposed solutions are grounded in users' needs, experiences, and contextual realities. According to (Liedtka, 2018), this approach is effective in generating innovative solutions grounded in users' real needs. In the museum context, (Packer, 2016) argues that modern exhibition design should be able to construct meaningful visitor experiences through visual systems that are structured, communicative, and interpretative.

## 1. Empathize

The empathize stage aims to understand users' needs, experiences, and perceptions of the display system at the Museum Perang Sintuk. In the context of exhibition space design, understanding visitors' experiences becomes the primary foundation for formulating appropriate and effective design solutions (Arini et al., 2025). Data were collected through direct observation and interviews. The observation was conducted on May 1, 2024, at the Museum Perang Sintuk, located on Jalan Raya Pakandangan, Sintuk, Padang Pariaman Regency, West Sumatra. The museum functions as a medium for preserving the values of the local struggle of the Padang Pariaman community and houses various collections, including traditional weapons, war equipment, visual documentation, and historical artifacts related to resistance against colonial forces.

As a public educational space, the museum holds a strategic role in fostering historical awareness among younger generations. However, based on field observations, the display system has not yet been optimally organized. Several collection labels are not properly arranged, the typography lacks readability, and there is no clear visual hierarchy between titles, subtitles, and informational content. In addition, the lighting and arrangement of the collections remain conventional and are not supported by a structured curatorial narrative. These findings are consistent with (Mason, 2022) who emphasizes that a human-centered design approach in museums is essential to enhance visitor experience and engagement. Contemporary museum studies also explain that effective exhibition design must consider aspects of visual readability, narrative structure, and spatial experience in order for information to be optimally understood by audiences (Goestien et al., 2023).

In addition to observation, an interview was conducted on May 1, 2024, with Mr. Rio, the manager of the Museum Perang Sintuk. Based on the interview results, it was found that the museum's display system and interior layout have not undergone significant updates since the museum was first established. Budget limitations and the lack of curatorial personnel are the primary factors contributing to the suboptimal visual presentation of the collections. Documentation of the building condition and museum collections at the time of observation is presented in Figure 1 below.



Figure 1. Condition and collection Sintuk War Museum

Based on the results of field observations and interviews with the museum management, it can be concluded that the primary issues lie in the lack of visual structure within the display system, the weak information presentation system, and the absence of a visitor-centered design approach. The unsystematic visual structure has resulted in the absence of a clear information hierarchy, causing visitors to experience difficulty in understanding the sequence of the historical narrative presented. (Khoirunnisa, et al., 2019). In addition, the use of typography, layout composition, and the placement of informational labels have not fully adhered to the principles of readability and visual clarity, resulting in less effective message communication. This condition indicates that the museum still applies a conventional approach to collection presentation, without adequately considering interpretative aspects and an integrated spatial experience.

These findings indicate the need to optimize the display design based on visual communication principles and the Design Thinking method as a user-oriented approach. Through the implementation of a clear visual hierarchy, systematic information grouping, and the design of circulation flow that supports the curatorial narrative, the museum can enhance the effectiveness of historical message delivery while simultaneously enriching visitors' educational experiences (Goestien et al., 2023). This approach does not merely focus on aesthetic aspects but also emphasizes the quality of visitor

interaction and meaning-making in relation to the collections, enabling the museum to transform into a more communicative, informative, and contextual learning space

## 2. Define

After the initial stage of understanding users' needs and experiences, the design thinking process proceeded to the define stage, which aims to clearly formulate the main problems based on the collected data. At this stage, the findings obtained from observations and interviews were systematically analyzed to identify the key issues affecting the quality of the display design at the Museum Perang Sintuk. SWOT analysis (Strengths, Weaknesses, Opportunities, and Threats) was employed to map the internal and external factors related to the museum's display design (Andika et al., 2025).

Internal factors, including strengths and weaknesses, were analyzed to assess the museum's existing conditions, including the characteristics of its collections, spatial layout, and the current display system. Meanwhile, external factors, consisting of opportunities and threats, were examined to understand environmental influences that may either support or hinder the future development of the display system. This analytical approach enables a structured and data-driven problem formulation, ensuring that the proposed design strategies are not only aesthetically oriented but also contextual and applicable. SWOT analysis is considered an effective tool at the define stage of the design process, as it integrates existing conditions with realistic development potential (Putri et al., 2025). The results of the mapping of internal and external factors are systematically presented in Table 1, which serves as the foundation for formulating development strategies and optimizing the display design of the Museum Perang Sintuk

**Table 1.** SWOT Analysis Results

<b>Strengths</b>	<b>Weaknesses</b>
<ul style="list-style-type: none"> <li>• Possesses authentic historical collections</li> <li>• Has strong educational potential</li> <li>• Demonstrates a high level of commitment from museum management</li> <li>• Provides clear and easily understandable collection narratives and information</li> </ul>	<ul style="list-style-type: none"> <li>• The display layout has not been optimally organized</li> <li>• Lighting conditions are uneven and insufficient</li> <li>• The display system has not undergone significant updates since the museum was first established</li> <li>• Visual information remains limited, particularly in the labeling of collections</li> </ul>
<b>Opportunities</b>	<b>Threats</b>
<ul style="list-style-type: none"> <li>• Increasing public interest in local history and cultural heritage</li> <li>• The potential implementation of interactive and digital media in museum display design</li> <li>• Support from local government and cultural institutions</li> <li>• Opportunities for educational collaboration with schools and academic institutions</li> </ul>	<ul style="list-style-type: none"> <li>• Limited funding for museum development and display renewal</li> <li>• Competition with other cultural and tourism destinations</li> <li>• Risk of collection deterioration due to inadequate display and lighting systems</li> <li>• Declining visitor engagement if display design is not continuously improved</li> </ul>

Based on the results of the SWOT analysis, several key issues related to the display system at the Museum Perang Sintuk were identified. Although the museum possesses authentic historical collections and strong educational potential, the display layout, lighting distribution, and existing visual information system have not been optimally developed. Limitations in labeling, the absence of a clear visual hierarchy, and the lack of a structured exhibition narrative reduce the effectiveness of the exhibition as a medium of visual communication. Therefore, the primary problem addressed in this study focuses on the inadequately organized display arrangement, insufficient visual support, and the lack of an integrated exhibition narrative capable of enhancing visitors' understanding of the historical content.

In accordance with contemporary museological and curatorial principles, display design should function as a strategic visual communication medium capable of organizing information, guiding visitor circulation, and enhancing the learning experience. Research by (Wulandari et al.,





2017) indicates that exhibition space design elements such as circulation, lighting, and display techniques contribute significantly to the effective delivery of messages to museum visitors. Another study by (Oktaviani et al., 2023) also emphasizes the importance of layout, color, and lighting in attracting visitors' interest and creating an effective visual experience within museum spaces. Therefore, optimizing the display design at the Museum Perang Sintuk is essential to strengthen visitors' visual experience and educational engagement. By integrating internal strengths with external opportunities, the proposed display design strategy is expected to address existing weaknesses and minimize potential threats, thereby creating a more communicative, contextual, and effective exhibition environment in accordance with the characteristics of a local history museum (Goestien et al., 2023).

### 3. Ideate

At the ideate stage, the display design concept for the Museum Perang Sintuk was formulated based on the issues identified in the previous stage, using a visual communication design approach grounded in human-centered design principles. The display is positioned not merely as a physical structure for placing artifacts, but as a narrative medium that actively communicates historical information in a structured, secure, and easily understandable manner (Mason, 2022). Therefore, the design concept integrates layout organization, material selection, lighting, and graphic visualization to create an exhibition flow that is informative, educational, and communicative.

The design approach emphasizes the use of simple, neutral, and proportional forms to avoid visual dominance and maintain focus on the historical collections (Ghunadi et al, 2021). Transparent materials such as glass are applied to enhance artifact visibility while ensuring collection security, whereas solid materials with natural tones function as supporting elements that convey a sense of stability and protection. Directed lighting is strategically designed to highlight artifact details and establish visual focus, enabling visitors to experience the exhibition in a comfortable, clear, and meaningful manner (Rizki, 2021). As a visual representation of the concept development, Table 2 presents alternative display design sketches developed through the exploration of form, materials, and construction systems.

**Table 2.** Alternative Sketch

 <p>Alternative 1</p>	 <p>Alternative 2</p>
 <p>Alternative 3</p>	 <p>Alternative 4</p>

Based on the established design concept, four alternative display designs were developed to explore visual and functional solutions for the Museum Perang Sintuk. The development of these alternatives refers to exhibition design principles that emphasize the integration of aesthetic aspects, functionality, and visual communication within museum spaces. Research by (Wulandari et al.,

2017) indicates that the effectiveness of message delivery in museums is influenced by the organization of layout, lighting, and display systems that support readability and visual focus.

Alternative 1 consists of a vertical modular vitrine that emphasizes spatial flexibility, collection security, and layout efficiency. This aligns with the findings of [Zakiah et al., 2025](#)), who state that adaptive spatial arrangements enhance navigation and the understanding of exhibition flow. Alternative 2 consists of a tiered pedestal display with integrated internal lighting to establish a clear visual hierarchy and enhance focus on the main artifacts. Research by [\(Zahariev, 2025\)](#) explains that the use of controlled lighting has a direct impact on the quality of visual perception and visitors' emotional engagement. Alternative 3 consists of a minimalist glass vitrine that prioritizes transparency and minimizes visual distraction. This is consistent with the findings of [\(Hu et al., 2024\)](#), which indicate that clean and uncluttered display designs enhance focus and improve information retention. Meanwhile, Alternative 4 consists of a thematic wall display with concealed lighting that reinforces the exhibition narrative and supports spatial circulation. Recent research in *Visitor Studies* indicates that a clear narrative structure enhances context-based learning experiences [\(Davidson, 2025\)](#). Overall, the four alternatives represent diverse approaches to optimizing display design as a medium of visual communication within the context of a local history museum, particularly at the Museum Perang Sintuk.

The design evaluation was conducted through discussions with museum management and visitors, which indicated that displays featuring focused lighting and clear visual information are more effective in facilitating historical understanding. The evaluation results show that display designs incorporating directed lighting and well-structured visual information are perceived as more engaging and effective in helping visitors comprehend historical context. Among the four developed alternatives, Alternative 2 and Alternative 4 were considered the most effective in combining visual clarity, spatial efficiency, and narrative strength. Therefore, these two alternatives were selected for further development at the prototyping stage to produce a display system that is communicative, secure, and educational for the Museum Perang Sintuk.

#### 4. Prototype

After the selected display design was determined, a prototype was developed using three-dimensional modeling software, Rhinoceros. This prototype aims to provide a realistic visualization of the proposed museum display system as it would be implemented within the exhibition space of the Museum Perang Sintuk. Through this prototype, aspects such as spatial arrangement, scale, lighting, and artifact placement can be evaluated to ensure visual communication clarity, visitor comfort, and collection security before further implementation. In the context of exhibition space design [\(Arini et al., 2025\)](#) emphasize that the organization of layout and the arrangement of spatial circulation have a direct impact on visitor comfort and the overall effectiveness of the visiting experience. Therefore, the prototyping process was not solely focused on visual aspects, but also on simulating visitor movement flow and visual focal points within the exhibition space. As a representation of the prototype stage results, Figure 2 presents a three-dimensional visualization of the implementation of the display design within the exhibition space of the Museum Perang Sintuk, illustrating the integration of layout organization, lighting, and artifact placement.



Figure 2. Implementation Prototype

The implementation of the display design prototype in the exhibition space of the Museum Perang Sintuk demonstrates the arrangement of artifacts using a linear layout approach that directs visitor circulation in a structured flow from the introductory area to the main display zone. The left wall functions as a narrative information medium, providing historical context before visitors directly observe the artifacts, thereby creating a sequential and educational experience. The placement of vitrines in the center of the room is arranged symmetrically to maintain visual balance while ensuring adequate movement space for visitors.



At the of the space, a thematic wall display with accent lighting serves as a visual focal point, reinforcing the hierarchy of information and highlighting the main collections. The use of wood materials on the flooring and display elements creates a warm atmosphere and supports the historical character of the exhibition space. Furthermore, the spacing between displays and the intensity of lighting are carefully designed to ensure optimal artifact visibility without compromising conservation aspects. Through this prototype, a comprehensive evaluation of spatial composition, scale, lighting, and circulation comfort can be conducted before physical implementation.

## 5. Testing

The testing stage was conducted to evaluate the effectiveness of the proposed display design and to gather feedback from relevant stakeholders. This process involved presenting the display prototype to the museum management and several visitors, followed by focused discussions and interviews. The testing aimed to assess the extent to which the proposed design met the previously identified needs, particularly in terms of visual clarity, visitor comfort, collection security, and the delivery of narrative within the exhibition space of the Museum Perang Sintuk.

The evaluation of the display design within the exhibition context aligns with the findings of (Purba et al., 2025), which states that the quality of visitor experience is influenced by visual presentation strategies, spatial layout, and interpretative media used in exhibitions. This indicates that the prototype testing process constitutes a crucial stage to ensure that the design not only fulfills aesthetic considerations but also supports the museum’s educational and communicative functions as a space for transmitting cultural values. The feedback results from the testing process are summarized in Table 3 below to illustrate the aspects that have met the criteria as well as the components that still require refinement, particularly in the exhibition space of the Museum Perang Sintuk.

**Table 3.** Design Comparison

Existing Design	Latest Design
	
Changes	
<p>The display arrangement remains conventional, the collections have not been systematically grouped, and the available visual information is limited, resulting in less effective understanding of the historical context. General lighting is applied without emphasis on the main artifacts, causing collection details to be insufficiently visible. In addition, visitor circulation is unclear, and the overall visual experience remains limited.</p>	<p>The display is organized in a structured manner with narrative-based grouping of collections and clear visual information to enhance visitors’ understanding. Focused and concealed lighting is applied to highlight artifacts, create visual emphasis, and strengthen the exhibition atmosphere. The display layout supports clearer visitor circulation, an improved visual experience, and a stronger educational function.</p>

Based Based on the testing results, stakeholders stated that the integration of pedestal displays and thematic wall displays with focused lighting enhances information readability and strengthens visitors’ understanding of the historical context. The museum management also assessed that the

structured layout and clear visual hierarchy support smoother visitor circulation and reinforce the educational function of the exhibition for its audience, particularly within the exhibition space of the Museum Perang Sintuk (Goestien et al., 2023). Overall, the testing results indicate that the proposed display design effectively functions as a visual communication strategy and demonstrates strong potential for implementation and further development at the Museum Perang Sintuk.

## CONCLUSION

Based on the research findings, it can be concluded that the display system of the Museum Perang Sintuk still requires optimization to fully support the museum's educational and communicative functions. The primary issues lie in the lack of visual hierarchy, suboptimal information readability, and layout and lighting arrangements that do not yet adequately support the flow of the historical narrative. These conditions have limited visitors' visual experience and their understanding of the contextual meaning of the exhibited collections. Therefore, a structured and user-oriented design approach becomes a fundamental necessity in developing the museum's display system.

The implementation of the design thinking method—comprising the stages of empathize, define, ideate, prototype, and testing—proved effective in generating design solutions that are responsive to users' actual needs. Through observation, interviews, SWOT analysis, and the evaluation of alternative designs, a display concept was developed that emphasizes visual clarity, efficient space utilization, collection security, and the reinforcement of thematic narratives through directed lighting and systematic object grouping. The prototyping process enabled the simulation of spatial layout, circulation flow, and visual focal points, ensuring that the resulting design was well-measured and refined before physical implementation.

Overall, this study affirms that optimizing display design extends beyond the aesthetic arrangement of exhibition space; it functions as a visual communication strategy that contributes to constructing a more meaningful historical experience. The integration of aesthetic, functional, and educational aspects within the display system enhances visitors' focus, comfort, and comprehension of museum collections. The findings of this research are expected to serve as both a conceptual and practical reference for the development of display design in local history museums with similar characteristics.

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