

# Interactive Mixed Reality Museum for Ulos Batak Cultural Heritage Preservation and Global Recognition

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## ABSTRACT

Indonesia, with its abundant cultural riches, faces challenges in preserving the traditional Batak cloth, Ulos, which is now threatened by globalization and foreign cultural claims. Despite its designation as Indonesia's Intangible Cultural Heritage (WBTb) in 2014, Ulos has not yet received international recognition from UNESCO as part of the Intangible Cultural Heritage (ICH) list, crucial for its global preservation. This research explores the potential of an Interactive Mixed Reality Museum to preserve and promote Ulos Batak cultural heritage by creating immersive visitor experiences. The study aims to answer the research question: How can an Interactive Mixed Reality Museum enhance Ulos preservation? Employing a descriptive approach that incorporates literature reviews and location surveys, the research aims to design a museum environment that is both engaging and educational. The proposed museum, located in Medan, North Sumatra, features exhibition areas, interactive spaces, and souvenir sections, integrating cutting-edge technology to present Ulos in a hands-on, immersive way. Findings suggest that this approach can boost public appreciation, support UNESCO recognition, and positively impact the local economy through tourism and cultural crafts, blending modern technology with traditional heritage preservation.

**Keywords:** interactive museum, mixed reality, Ulos

## 1. Introduction

Indonesia is a cultural superpower, showcasing rich diversity from Sabang to Merauke. One of Indonesia's cultures is the traditional Batak cloth, namely Ulos. Ulos faces serious threats to its sustainability and authenticity caused by globalization and changing times [1]. Ulos is not just cloth, but also carries deep social, spiritual and symbolic meaning for the Batak people [2]. Seeing its uniqueness, Ulos has unfortunately become the target of claims by other countries [3]. Recognizing Ulos as an Intangible Cultural Heritage (WBTb) plays a crucial role in preserving cultural diversity amid the challenges of globalization [1]. This determination also strengthens the foundation for recognizing Ulos as a cultural heritage from Indonesia [4].

On October 17 2014, based on Ministerial Decree no. 270/P/2027, Ulos was designated as WBTb Indonesia. Even though it has high cultural value, Ulos has not received its recognition as part of the Intangible Cultural Heritage (ICH) list by UNESCO. This recognition is important to increase global awareness of the importance of Ulos as a WBTb that must be protected [5]. Based on article 2 of the 2003 UNESCO Convention in the

criteria for the Representative List of The Intangible Cultural Heritage of Humanity, extensive involvement of the supporting community is a mandatory requirement for Ulos to be included in UNESCO's ICH list [1].

Recognizing the challenges of gaining global recognition and preserving Ulos heritage, this research addresses the question: How can an Interactive Mixed Reality Museum enhance Ulos preservation? The proposed "Ulos Heritage: Mixed Reality-based Interactive Museum" is designed as an innovative solution, merging technological advancements with traditional values and broad community involvement. This design not only aims to safeguard Ulos but also to engage the public in more meaningful ways.

The Interactive Museum concept is a type of exhibition that provides interactive experiences to visitors in the form of physical action responses. This concept encourages more active exploration thereby increasing visitors' understanding of the museum's contents [6]. Mixed reality is especially well-suited for this initiative, as it follows global trends in museum design, where technology is increasingly leveraged to craft immersive and interactive experiences that connect the digital and physical realms [7]. Mixed reality is used as the main interactive technology to explore the virtual extension of the collection on display and guide museum visitors using virtual guides. Mixed reality allows for interaction between visitors and virtual content in real environments [8].

Mixed reality (MR)-based interactive museums hold significant potential to transform how we engage with history and culture [9]. Until now, mixed reality (MR) technology has not been widely applied in museums around the world and is still in the research stage only. This research seeks to push the boundaries by applying MR technology to preserve Ulos and promote it on an international stage.

This design supports Indonesia's efforts to make Ulos a world heritage in the Intangible Cultural Heritage (ICH) category by UNESCO and contributes to the Sustainable Development Goals' 11th goal on Sustainable Cities and Communities with target 11.4, Protecting the World's Cultural and Natural Heritage, and 9th goal on Industry, Innovation, and Infrastructure. Ulos Heritage is expected to be an important milestone in introducing and preserving Ulos as Batak cultural wisdom towards world heritage.

## **2. Design Approach and Methodology**

The main approach used in designing the Ulos Heritage Museum is an interactive technology approach. This technology is expected to support an interactive system between visitors and the exhibited collection objects. Visitors are no longer passively observing historical collection objects in one direction, but visitors can be active and get a reciprocal response [10]. Museum with interactive exhibition will provide new experience for visitors. This approach also involves the use of interactive technology such as mixed reality to increase visitor interaction with the exhibition. Apart from that, another approach used in designing the Ulos Heritage Museum is Cultural Heritage Tourism as a form of alternative tourism or special interest tourism which is a type of tourism that emphasizes experience and knowledge for visitors [11]. This approach seeks to provide visitors with a captivating and immersive experience.

The design of the Ulos Heritage Museum employed a descriptive method, which involved implementing literature reviews and location surveys. Selecting the location for the design of the Ulos Heritage Museum by considering the requirements for determining the location of the museum, such as the location chosen considering the land area, the location of the museum must be easy to reach and not far from the city center to facilitate access for local and foreign tourists, and not located in an industrial area. whose air is polluted. After determining the location, questionnaires were distributed regarding the museum concept, field surveys, and collecting the information needed to design the Ulos Heritage Museum.

## **3. Result and Discussion**

### **3.1. Planning Location**

The location of the design is in the area of Letjen S. Parman Street, Petisah Hulu, Medan Baru District, Medan City, North Sumatra Province. The location chosen took into account the land area and its strategic

location in the center of Medan City, making it easy for local and foreign tourists to access it. Apart from that, this location is near the Office and House of the Governor of North Sumatra Province, the House of the Mayor of Medan, and is still in the central area of Medan City. This location is also close to the consulate offices of several countries and is quite easy to reach for academics from the University of North Sumatra. The location is shown in figure 1.

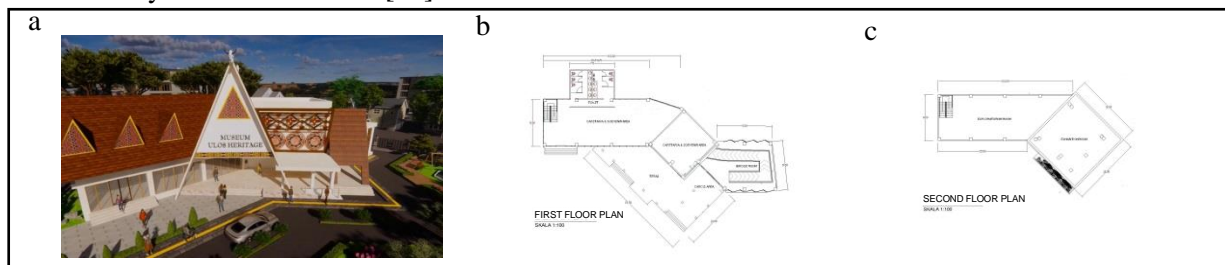


**Figure 1** Ulos Heritage Location  
Source: Google Earth

The location of the Ulos Heritage development as a museum is in accordance with Appendix VIII of Medan Regional Regulation Number 2 Year 2015 on the Detailed Spatial Plan and Zoning Regulations of Medan 2015 which allows the construction of museums directly in the K-1 Trade and Service Zone [12].

### 3.2. Design Concept

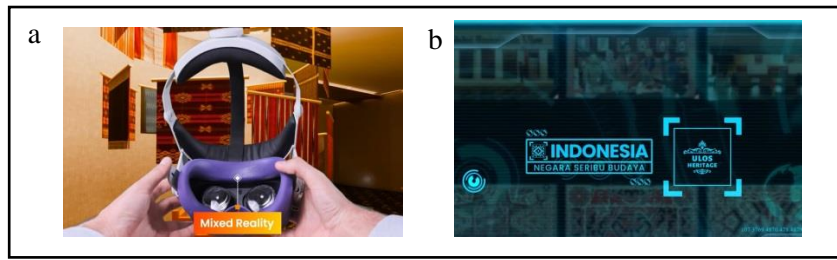
The Ulos Heritage Museum has been constructed in accordance with a traditional Batak architectural design, characterized by a gabled roof and a distinctive Ulos motif on the exterior. This architectural design reflects a respect for the cultural heritage of North Sumatra, particularly in regard to the preservation of the Ulos fabric tradition. The shape of the museum and the museum plan is shown in figure 2. The incorporation of traditional elements in conjunction with modern design elements creates a harmonious and elegant atmosphere. The location and design of the building are also intended to facilitate convenient access for visitors, both local and foreign. Overall, the museum serves as an important symbol in the effort to preserve and promote Batak cultural identity in the modern era [13].



**Figure 2** (a) Ulos Heritage Exterior; (b) Ulos Heritage Site Plan Level 1; (c) Ulos Heritage Site Plan Level 2

Source: Personal Documentation

Ulos Heritage adopts Mixed Reality as its main interactive technology to provide an immersive experience in its implementation. The application of this technology does not only include Augmented Reality to display virtual objects in the real world without interaction, or Virtual Reality which allows users to interact exclusively in the virtual world [14]. However, the concept combines both. Augmented reality aims to combine a computer-generated interactive environment with a real environment so that it appears as one and the same environment [15]. Visitors looking for innovative experiences will find Mixed Reality appealing that can be seen in figure 3. Ulos Heritage also uses a Cultural Heritage Tourism approach, which is oriented towards direct experience and deep understanding of local cultural heritage.



**Figure 3** (a) Mixed Reality Usage; (b) Information Displayed From The Mixed Reality  
Source: Personal Documentation

### 3.2.1. Exhibition Area

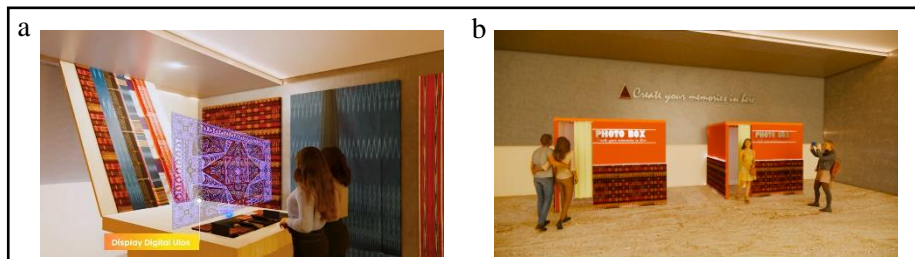
The use of Mixed Reality technology is the center of attention in the museum's Exhibition Area. With this technology, visitors can see and listen to information about history, the types of ulos available, their variations as well as historical collections displayed on the map of North Sumatra. Apart from that, this area also introduces the mangulosi which includes the tradition of draping Ulos on other people's shoulders and showing off the stages of making Ulos. The Exhibition Area aims to increase visitors' understanding of Ulos and also strengthen their ties with Batak cultural heritage. Exhibition area is shown in figure 4.



**Figure 4** (a) History of Ulos Development; (b) Map of Ulos Types; (c) Historical Ulos Collection  
Source: Personal Documentation

### 3.2.2. Exploratorium Area

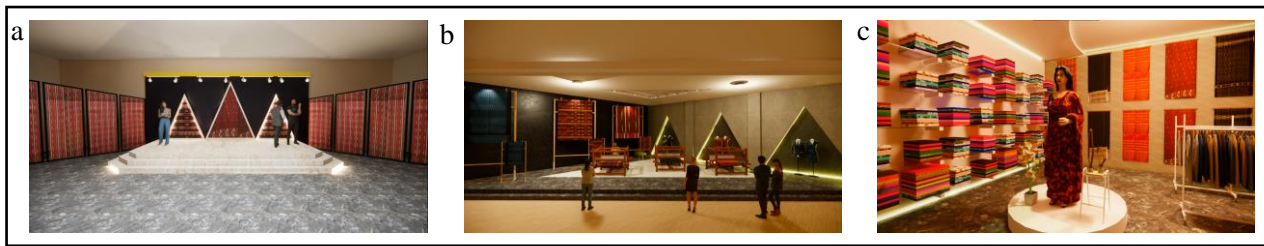
The Exploratorium Area Interactive Space provides an interesting physical experience to visitors. There is an interactive display called "Weaving Time" here, where visitors can arrange rows of Ulos motifs and see them displayed as a model of Ulos weaving on a digital screen that can be seen in figure 5a. By utilizing the results of this process, you can have a printed photo frame from Photobooth available as a souvenir is shown in figure 5b.



**Figure 5** (a) Weaving Time Area; (b) PhotoBox  
Source: Personal Documentation

Apart from that, in this area there are also Batak art performances that can be seen in Figure 6a. Opportunities for visitors to see firsthand the process of making Ulos by craftsmen and visitors also have the opportunity to try on traditional Batak clothing complete with Ulos and accessories is shown in Figure 6b and 6c. The Exploratorium area is designed so that visitors can be directly involved in cultural processes and practices through various interactive experiences.

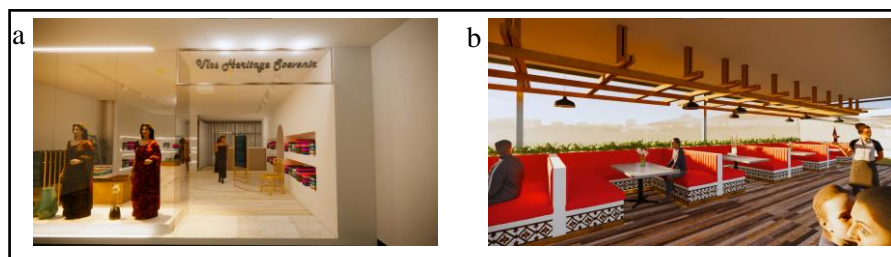




**Figure 6** (a) Performing Arts Area; (b) Hands-on Weaving Area; (c) Try On Area  
Source: Personal Documentation

### 3.2.3. Souvenir and Cafeteria Area

In the Souvenir Area and Cafeteria Area, MSMEs from all over North Sumatra gather to sell a variety of high quality Ulos crafts and dishes that showcase the luxury of North Sumatra culture, especially Batak culture. By making purchases in this area, visitors not only provide support for the growth of local MSMEs, but can also gain valuable pieces of cultural heritage and enjoy the unique and authentic taste of regional specialties. Souvenir and Cafeteria Area can be seen in figure 7.



**Figure 7** (a) Souvenir Area; (b) Cafeteria Area  
Source: Personal Documentation

## 4. Conclusion

The design of this museum aims to overcome the challenges of globalization and efforts to gain recognition from UNESCO as a World Heritage. "Ulos Heritage: Interactive Museum based on Mixed Reality" is designed as a solution that combines interactive technology with the preservation of traditional values. Interactive museums increase engagement and enrich visitors' understanding of history and culture, changing the way we learn and interact with cultural heritage. This museum utilizes mixed reality technology, which integrates Augmented Reality and Virtual Reality, to offer an immersive interactive experience. This approach aims to increase visitor engagement with the exhibition objects and deepen their understanding of Ulos and Batak culture. The project aims to strengthen public understanding of Ulos, encourage global recognition as an important cultural heritage, and have a positive impact on the local economy through tourism and crafts. Innovations in technology and museum design are expected to bridge the gap between cultural preservation and the needs of modern society.

To answer the research question—How can an Interactive Mixed Reality Museum enhance Ulos preservation?—the study highlights that mixed reality fosters deeper public awareness, supports UNESCO recognition efforts, and enriches the cultural experience.

Recommendations for museum designers include tailoring MR to the cultural context, using immersive storytelling, and designing flexible systems for future expansion. Further research should explore the long-term impact of MR on cultural heritage and how it can sustain global interest and support.

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## 6. Conflict of Interest

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## References

- [1] E. J. Purba, A. K. Putra, and B. Ardianto, “Perlindungan Hukum Warisan Budaya Tak Beda Berdasarkan Convention for The Safeguarding Of The Intangible Cultural Heritage 2003 dan Penerapannya di Indonesia,” *Uti Possidetis: Journal of International Law*, vol. 1, no. 1, pp. 90–117, 2020.
- [2] R. M. U. Manalu, R. H. Simanjuntak, and Casiavera, “Pelestarian Makna Simbolik Ulos Dalam Memperkuat Identitas Budaya Masyarakat Batak Toba Di Kota Tanjungpinang,” *Social Issues Quarterly*, vol. 1, no. 3, pp. 735–743, 2023.
- [3] P. G. Siahaan, A. M. Ramli, U. Sudjana, and R. R. Permata, “Legal Protection Of Ulos Batak Toba Traditional Motifs As Communal Intellectual Property In The Development Of National Law,” *Journal of Positive School Psychology*, vol. 6, no. 6, pp. 10685–10703, 2022.
- [4] F. N. Situmorang and E. N. D. Nst, “Peran UNESCO dan Upaya Indonesia Mengangkat Ulos Toba sebagai Warisan Dunia,” *JoGP (Journal of Global Perspective)*, vol. 1, no. 1, pp. 13–24, 2023.
- [5] R. A. Hasibuan and S. Rochmat, “Ulos Sebagai Kearifan Budaya Batak Menuju Warisan Dunia (World Heritage),” *Patrawidya*, vol. 22, no. 3, pp. 307–320, 2021.
- [6] E. Thenesa, H. Indrawan, and Mariana, “Penerapan Konsep Interaktif pada Ruang Pameran Museum Pemadam Kebakaran,” *MEZANIN*, vol. 5, no. 1, pp. 109–114, 2022.
- [7] R. Hammady, M. Ma, C. Strathern, and M. Mohamad, “A Survey of Augmented, Virtual, and Mixed Reality for Cultural Heritage,” *Multimed Tools Appl*, vol. 79, pp. 3465–3494, 2020.
- [8] K. H. Mkwizu, “Mixed Reality and Resilience in Tourism,” *International Journal of Advanced Virtual Reality*, vol. 1, no. 1, pp. 1–7, 2023.
- [9] M. Trunfio, T. Jung, and S. Campana, “Mixed reality experiences in museums: Exploring the impact of functional elements of the devices on visitors’ immersive experiences and post-experience behaviours,” *Information & Management*, vol. 59, no. 8, 2022.
- [10] P. Salim, C. R, and S. Rachmayanti, “Perancangan Desain Interior Museum dengan Teknik Interaktif sebagai Ruang Publik Masa Kini,” *Dimensi*, vol. 15, no. 1, pp. 45–54, 2018.
- [11] L. T. Tambunan and N. Tarigan, “Pengembangan Kesawan sebagai Cultural Heritage Tourism di Kota Medan,” *Jurnal Akomodasi Agung*, vol. 9, no. 2, pp. 71–80, 2022.
- [12] Pemerintah Kota Medan, “Lampiran VIII Peraturan Daerah Kota Medan Nomor 2 Tahun 2015 Tentang Rencana Detail Tata Ruang dan Peraturan Zonasi Kota Medan Tahun 2015 - 2035,” 2015, *Medan*.
- [13] Pemerintah Indonesia, “Peraturan Pemerintah Nomor 66 Tahun 2015 Tentang Museum,” 2015, *Sekretariat Negara, Jakarta*.
- [14] A. P. Nadhia, M. A. Ayana, A. R. Saputra, and S. N. Islami, “Penerapan Mixed Reality dalam Bidang Pendidikan,” *Journal of Information System and Technology (JOINT)*, vol. 4, no. 1, pp. 355–360, 2023.
- [15] A. I. Rahmat, D. Andreswari, and Y. Setiawan, “Perancangan Aplikasi Augmented Reality Buku Koleksi Benda Bersejarah Sebagai Media Informasi Interaktif dan Media Promosi (Studi Kasus: Museum Negeri Bengkulu),” *Rekursif: Jurnal Informatika*, vol. 9, no. 2, pp. 153–164, 2021.