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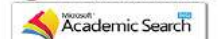
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Augmented reality for Betawi cultural representation: bridging symbolic familiarity and understanding among Generation Z



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ABSTRACT

Generation Z is widely characterized as digitally adaptive, critical, and open to cultural diversity; however, this openness also exposes them to intensive global cultural influences that may weaken engagement with local heritage. This study investigates the gap between symbolic familiarity and substantive cultural understanding of Betawi culture among Generation Z in Jakarta and examines how this gap can inform the design of technology-mediated cultural learning. Employing a design sociology approach within an exploratory mixed-method framework, this research conceptualizes design as a sociocultural mediator between cultural values, user behavior, and technological experience. Data were collected through questionnaires administered to 100 Generation Z respondents in Jakarta, complemented by observations and semi-structured interviews. The findings reveal that while respondents demonstrate high symbolic recognition of Betawi cultural icons, their understanding of historical and cultural meanings remains limited. This discrepancy indicates that cultural appreciation among Generation Z tends to be superficial and mediated by visual exposure rather than contextual knowledge. Based on these insights and respondents' strong familiarity with digital technology, this study proposes an augmented reality (AR)-based cultural representation model that translates user preferences into experiential and interactive learning media. The development of the "Imaji Betawi" AR concept represents the study's applied outcome, while its primary scientific contribution lies in framing AR as a design-based cultural interface that bridges symbolic recognition and deeper cultural understanding. This research contributes to discussions on cultural representation, visual culture, and technology-enhanced learning by demonstrating how sociologically informed design can support local cultural preservation for digitally native generations.



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1. Introduction

Advances in digital technology have significantly increased access to information and cultural content from around the world. As a globally connected generation, Generation Z actively uses social media to engage with transnational networks and global popular cultures. This condition facilitates the intensive circulation of foreign cultural influences within Indonesian society, many of which are readily embraced by Generation Z. While such exposure may enrich cultural perspectives, it simultaneously contributes to the marginalization and gradual degradation of local cultural values [1]. The rapid global diffusion of Korean popular culture (K-Pop), for example, has strongly influenced the lifestyles, consumption patterns, and aesthetic preferences of Generation Z, shaping their choices in fashion, music, food, and media [2]. If this dominance of global popular culture is not balanced by

systematic efforts to strengthen awareness and engagement with local cultural heritage, there is a growing concern that local identities may become increasingly detached from younger generations [3]. Despite Jakarta being the cultural center of Betawi heritage, studies and digital media initiatives that specifically address how Generation Z perceives, engages with, and reimagines Betawi culture remain limited. This gap highlights the need for innovative cultural preservation strategies that align with the digital preferences of Generation Z, particularly through immersive media such as augmented reality.

This study focuses on efforts to increase the appreciation and engagement of Betawi culture among Generation Z living in DKI Jakarta. Although Betawi culture remains a significant indigenous cultural heritage in Indonesia's capital region, it continues to face erosion due to demographic shifts, globalization, and the dominance of global popular cultures. Previous research on cultural preservation and education using digital technology has demonstrated the potential of interactive media to support cultural learning. For example, immersive technologies such as augmented reality (AR) have been shown to enhance engagement with cultural heritage by providing contextualized visual information and interactive experiences [4]. Verhulst et al. stated that AR can improve cultural appreciation and recall among young users but noted limitations in addressing deep cultural meaning due to the focus on surface interaction design [5]. Similarly, Zhang et al. conducted a meta-analysis of AR applications in heritage contexts, highlighting that while AR promotes accessibility and engagement, there remains a need for user-centered design that aligns with specific audience preferences and cultural contexts [6]. However, few studies have investigated how AR can be tailored specifically to the cultural values and knowledge frameworks of Generation Z in Jakarta, particularly regarding Betawi traditions, symbols, and practices. Studies on AR in cultural education have often focused on historical sites or broad cultural heritage rather than localized, living cultures embedded in urban communities. Therefore, this study aims to fill this gap by examining how AR design, informed by the preferences of Generation Z, can be used to increase their appreciation and cultural engagement with Betawi culture.

Augmented reality (AR) has been widely applied in cultural education and heritage communication due to its ability to integrate digital content with real-world environments through interactive visual and spatial experiences. Previous studies have demonstrated that AR can support cultural dissemination and public awareness by enhancing accessibility and engagement with cultural objects and narratives [7]. In the Indonesian context, research has explored the use of AR to introduce local cultural elements, such as Betawi Gambang Kromong art as a marketing and promotional medium [8] and the visualization of traditional textiles in museum collections, such as Lampung's *kain tapis* [9]. These studies primarily positioned AR as a tool for cultural presentation and information delivery. However, they have not explicitly examined how AR design can be informed by the cultural perceptions, expectations, and learning preferences of specific user groups. The novelty of this study lies in its user-centered and sociocultural design approach, which positions Generation Z in Jakarta not only as recipients of cultural information but as active reference points in the design process. By first investigating Generation Z's understanding of Betawi cultural values and their expectations toward learning Betawi culture through AR-based media, this study integrates empirical questionnaire findings into the design and development of an AR application named "Imaji Betawi". *Imaji Betawi* is conceived as a digital cultural learning medium that represents Betawi culture through interactive AR experiences, aiming to enhance cultural imagination, engagement, and appreciation among Generation Z.

2. Method

This study employed a mixed-methods exploratory design-based research approach, grounded in a design sociology framework, to investigate how Generation Z in Jakarta perceives and engages with Betawi culture and how these social insights can inform the design of an AR-based cultural application. Rather than positioning design as a purely visual or functional outcome, the design sociology approach frames design as a sociocultural construct shaped by social behavior, cultural values, and everyday practices [10]. In this context, design is understood as part of a broader social system that mediates the relationship between users, cultural meanings, and technological representation. The design sociology framework was operationalized by examining Generation Z's cultural perceptions, media habits, and expectations toward Betawi culture, and systematically translating these social findings into design considerations for an AR application. This approach

allowed the study to bridge sociological analysis and design practice by linking empirical social data to cultural representation, user experience, and design objectives.

2.1. Data Collection

Data were collected through a combination of quantitative and qualitative methods. First, a questionnaire survey was administered to 100 Generation Z respondents living in Jakarta and its surrounding areas. The questionnaire consisted of closed-ended questions to capture demographic information, media usage patterns, and levels of familiarity with Betawi culture, as well as open-ended questions to explore respondents' expectations, interests, and perceptions regarding learning Betawi culture through AR-based media. Second, qualitative data were gathered through observations and semi-structured interviews with selected respondents. Observations focused on respondents' interactions with digital media and cultural content, while interviews were conducted to gain deeper insights into their cultural attitudes, motivations, and interpretations of Betawi cultural symbols. These qualitative methods were used to complement the survey data and to enrich the sociocultural analysis. The respondent profile based on the questionnaire is provided in Table 1.

Table 1. Respondent Profile

Category	Sub category	Number of respondents
Gender	Male	52
	Female	48
Age	12-17 years old	16
	18-20	45
	21-25	36
Age	26-28	3
	Junior High School	6
Education	Senior High School and equivalent	12
	Higher education students	82

2.2. Data Analysis

Quantitative data from the questionnaire were analyzed descriptively to identify dominant patterns related to Generation Z's media preferences, cultural awareness, and expectations toward AR-based cultural learning. Qualitative data from open-ended questionnaire responses, interviews, and observations were analyzed using thematic analysis, focusing on recurring themes related to cultural imagination, identity, engagement, and perceptions of Betawi culture. The findings from both data sets were then interpreted through the lens of the design sociology framework, linking Generation Z's social behavior and cultural perceptions with theoretical perspectives on youth culture, local identity, and mediated cultural representation.

2.3. Design Translation and Application Development

The final stage of the research involved translating the empirical findings into design criteria for the development of an AR application named "Imaji Betawi". The identified themes and preferences derived from Generation Z respondents were used as references for determining visual elements, cultural symbols, interaction design, and narrative structure within the application. In this way, the AR application functions not only as a technological artifact but also as a sociocultural medium designed to enhance cultural imagination and appreciation of Betawi culture among Generation Z.

3. Results and Discussion

Referring to the design sociology approach used in this study, the discussion focuses on matters related to Generation Z's behavior in appreciating Betawi culture. The discussion presented is divided into two focuses and scopes, namely those related to: (1) Generation Z's knowledge of Betawi culture, and (2) Betawi culture in Augmented Reality (AR).

3.1. Generation Z's knowledge of Betawi culture

Based on Indonesia's 2020 Population Census, Generation Z constitutes the largest demographic group, accounting for 27.94% of the total population, while in Jakarta, individuals born between 1997 and 2012 represent approximately 25.65% of the population [11]. This demographic composition indicates that Generation Z plays a significant role in shaping cultural consumption patterns in urban contexts. Previous studies characterize Generation Z as digital natives whose daily activities, communication styles, and knowledge acquisition are deeply embedded in digital technologies and

online platforms [12] [13]. Such technological immersion influences not only their media preferences but also their perceptions of cultural content, including local and traditional cultures. Research on youth and cultural engagement suggests that traditional culture is often perceived by younger generations as distant or less relevant when it is presented through conventional or non-interactive forms [14]. However, cultural identity itself remains a persistent social construct, as local culture continues to function as a collective and symbolic reference shaping social belonging and identity. In this context, the large proportion of Generation Z in Jakarta, combined with their strong attachment to digital media, represents both a challenge and an opportunity for local cultural preservation. While Betawi culture risks being overlooked in everyday digital consumption, these same digital characteristics provide a strategic entry point for recontextualizing local culture through interactive and immersive media. This condition underlines the academic urgency of examining how digital technologies, particularly augmented reality, can be leveraged to foster cultural engagement and appreciation among Generation Z.

The questionnaire included several items related to Betawi culture in order to assess respondents' levels of cultural familiarity and understanding. When asked whether they were familiar with Betawi culture, 92% of respondents stated that they were familiar, while 8% reported unfamiliarity. At first glance, this high level of self-reported familiarity suggests that Betawi culture remains recognizable among Generation Z in Jakarta. However, further analysis reveals a significant distinction between symbolic recognition and substantive cultural understanding. When respondents were asked to identify Betawi cultural elements they knew, 90% mentioned *ondel-ondel*, while other art forms such as *lenong* Betawi (4%), *tanjidor* (4%), Betawi mask dance (1%), and Betawi culinary heritage (1%) were far less recognized. This concentration of responses on a single iconic symbol indicates that Generation Z's familiarity with Betawi culture is largely limited to surface-level visual representation rather than a broader or deeper knowledge of its cultural diversity. This pattern becomes more evident when respondents were asked about their understanding of the historical background of the Betawi cultural elements they selected. While 67% stated that they knew the history, 33% reported that they did not, suggesting a notable gap between recognition and historical or contextual understanding. This empirical finding highlights a key problem in contemporary cultural engagement: local culture may be widely recognized symbolically but insufficiently understood in terms of meaning, history, and cultural values. Such a gap underscores the need for educational interventions and learning media that can bridge visual familiarity with deeper cultural comprehension, thereby forming a critical foundation for the development of interactive and immersive cultural learning tools, such as augmented reality-based media.

Based on the questionnaire responses, it was found that the Betawi culture most familiar to Generation Z, and perhaps even all generations, is *ondel-ondel*. This is understandable because *ondel-ondel* is an icon of Jakarta, found in almost every corner of the city. The Betawi people are the native inhabitants of Jakarta. The Betawi people are the result of intermarriage between ethnicities and nations that previously lived in Jakarta, such as Javanese, Sundanese, Arabs, Makassarese, Malays, Indians, Bugis, Ambonese, and Chinese. *Ondel-ondel* is a large Betawi puppet with its own uniqueness. Initially, it was known as *barung*, which later changed to *barongan*. In Betawi, *barongan* is interpreted as 'a group of people,' because basically, the art of *barongan* cannot be played alone [15]. From the results of interviews with five Generation Z members, it was obtained that they learned about *ondel-ondel* from frequently seeing a pair of these large puppets walking down the streets around their homes. The pair of *ondel-ondel* walked while traditional Betawi songs were playing and their purpose was to busk. The *ondel-ondel*'s busking, of course, is inconsistent with their intended function. *Ondel-ondel* is a cultural icon for the Betawi people, as stipulated in Jakarta Governor Regulation No. 11 of 2017. This regulation also outlines criteria for the use of *ondel-ondel* as a Betawi cultural icon. *Ondel-ondel* is a manifestation of ancient Betawi culture that is still easily found in remote areas of Jakarta, primarily due to its designation as a city icon. Today, *ondel-ondel* continues to thrive as a tourist attraction. At the same time, some Jakarta residents also use *ondel-ondel* for busking. These buskers include not only native Betawi but also non-Betawi residents. In Jakarta, *ondel-ondel* is often paraded around the city and even through villages. *Ondel-ondel* has been used pragmatically by the community. Today, *ondel-ondel* often perform on the streets in their bare essentials, without the usual accompaniment of musical accompaniment or a full musical ensemble. This large doll is a deformation of the human body shape, displayed with a neckless face and colorful clothing.

Ondel-ondel has experienced continuity and changes in costume elements and functions, but it is still used according to interests. *Ondel-ondel* is interesting because the costume elements and their meanings continue to change according to the social, political, economic, and cultural contexts related to the role of power in certain periods. Amid the onslaught of modernization and the rise of digital entertainment, physical *ondel-ondel* is increasingly rare. If it does exist, the function is more as a supplementary means for buskers to earn a living. This has resulted in Generation Z's limited knowledge of the true function of *ondel-ondel*. The lack of *ondel-ondel* craftsmen also makes it increasingly difficult to find *ondel-ondel* performances in Jakarta. Even if it does exist, it is only held at certain times, such as on Jakarta's anniversary and Independence Day on August 17th. Therefore, more attention is needed to maintain and preserve this traditional Betawi art form to prevent its extinction. Using technology as a medium to introduce Betawi culture and its history is a preferable choice, especially if the target is the younger generation, for example, Generation Z. Betawi culture is indeed widely known by the general public, especially the Betawi ethnic group itself. However, not everyone is aware of the history behind this culture. This is evident from the questionnaire results, which asked whether the respondents knew the history of Betawi culture, particularly Betawi arts, which they had selected in the previous question. The answers obtained were 67% stated they did not know, while 33% stated that they did. Based on interviews with five Generation Z members, their lack of knowledge about the history of Betawi arts stemmed from the rare discussions related to it on the social media platforms they typically access. Even when discussions were conducted, the presentation tended to be boring. However, formal discussions about Betawi culture are provided in Jakarta Cultural Environmental Education (*Pendidikan Lingkungan Budaya Jakarta/PLBJ*) classes during elementary and junior high school.

To enhance Generation Z's appreciation of Betawi local culture, it is essential to identify which cultural attributes resonate most strongly with them. Therefore, respondents were asked to indicate the aspects of Betawi culture they found interesting (Fig. 1), with multiple responses allowed. The results reveal a clear dominance of sensory-based attributes, particularly bright colors (67%) and attractive music (67%), followed by dynamic movements (35%). In contrast, more cognitive and reflective aspects, such as the philosophy underlying Betawi culture, were selected by a smaller proportion of respondents (42%), while linguistic characteristics, culinary traditions, and socio-cultural traits received minimal attention (each below 2%). This distribution suggests that Generation Z's engagement with Betawi culture is primarily driven by visual and auditory stimuli rather than by historical, philosophical, or linguistic dimensions. Such a pattern aligns with Generation Z's characteristics as a digitally native generation that is highly responsive to visually rich, dynamic, and immersive content. The relatively lower interest in abstract cultural meanings indicates that cognitive-cultural engagement may require mediation through appealing sensory experiences. These findings imply that cultural learning strategies targeting Generation Z should prioritize visual and audio-driven entry points, which can subsequently function as gateways to deeper cultural understanding. In this context, augmented reality-based media become particularly relevant, as they allow the integration of vivid visual elements, sound, and movement while simultaneously embedding cultural narratives and philosophical meanings within an interactive learning environment.

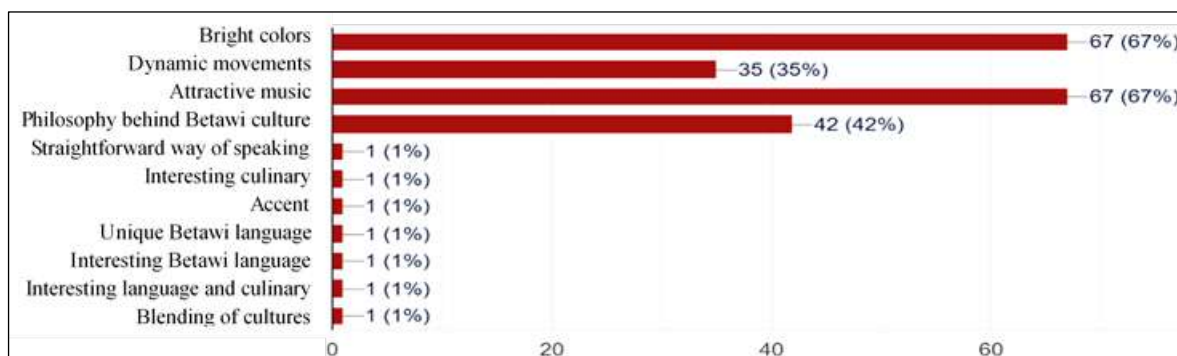


Fig. 1. Attractive factors of Betawi culture according to respondents

According to respondents, one of the attractive factors of Betawi culture is the use of bright colors. Betawi is synonymous with bright colors. These colors are applied in various aspects related to Betawi culture and arts. Betawi colors frequently used in cultural activities can be categorized based on primary, secondary, and additional neutral colors: yellow, orange, red, purple, blue, green, black, gray,

and white. The yellow category includes yellow, *kepodang* (oriole), *gading* (ivory), *kunyit* (turmeric), and *telur* (egg). In Betawi culture, red is one of the typical Betawi colors, interpreted as festivity, courage, and respect. In addition to being heavily influenced by Chinese and Hindu cultures, the Betawi people often use red in all cultural activities. Furthermore, the red face of the male *ondel-ondel* symbolizes courage and decisiveness in warding off and protecting the Betawi people from danger. In Betawi artistic performances, red is used as an invitation and adds to the festivity [16]. Contrasting color combinations (in a Betawi term, *tabrakan*, meaning collision) best describe the Betawi colors. The combination of many bright colors reflects the Betawi people's cheerfulness, assertiveness, and resilience in facing the harshness of the capital city. The simplification of some Betawi color codes into a universal color code indicates that the Betawi people are receptive and dynamic to changes around them. However, the Betawi people are also able to demonstrate their assertiveness in facing acculturation by using bright color combinations, as evidenced by their use of color in art and culture.

The attractive Betawi music is one factor that respondents found appealing. It is undeniable that Betawi music features a lively blend of musical instruments. *Gambang Kromong*, *tanjidor*, *lenong* Betawi, and the accompanying music for traditional Betawi dances all boast energetic rhythms. *Gambang Kromong* music in Betawi society represents a fusion of several cultures interacting with each other (acculturation). This can be seen in the various instruments used in the ensemble, such as Chinese string and wind instruments, Sundanese drums, and Javanese *gambang*, *kromong*, *kempul*, *kecrek*, and *gong* [17]. *Tanjidor* serves as a form of entertainment for the community. Therefore, the Betawi people refer to this *tanjidor* art form as the *tanjidor* orchestra. *Tanjidor* predominantly uses wind instruments [18]. The philosophy behind Betawi culture was the next most appealing factor according to the respondents, after color and music. Betawi cultural philosophy is defined as everything related to the results of human activity and reason (the Betawi people), one of which is Betawi art. This was what the respondents who completed the questionnaire found interesting. Therefore, it can be concluded that Generation Z is interested in understanding the background of Betawi culture, including its art. When asked about the need to preserve Betawi culture, 99% of respondents stated it was necessary, while 1% stated it was not necessary. This figure indicates that Generation Z still has a high level of concern for the preservation of local Indonesian culture, including Betawi culture. However, various efforts are needed to increase Generation Z's awareness of Betawi culture, which should be done through approaches that resonate with them.

The final question in the questionnaire, related to Betawi culture, asked respondents to choose which culture they considered most appealing among the following cultures: Korean, Japanese, American, and Indonesian. The answers from Generation Z are as follows: 71% chose Indonesian culture, 21% Japanese culture, 5% Korean culture, and 3% American culture. These answers were beyond prediction considering the strong influence of foreign cultures that they like and are often uploaded to social media. Thus, for Generation Z, Indonesian culture is still considered the most interesting, even though in their daily lives they adapt foreign cultures (for example, Korean), starting from the way they dress, appearance, culinary, to the use of language. This is an indicator that there is still an opportunity to increase Jakarta Generation Z's appreciation for Betawi Culture. Based on the questionnaire responses related to Generation Z's knowledge of Betawi culture, the following conclusions were drawn. (1) The majority of respondents (92%) were familiar with Betawi culture; (2) Betawi culture, especially art, which was most familiar to Generation Z was *ondel-ondel* (90%); (3) The majority of respondents (67%) admitted that they did not know the history of Betawi culture; (4) The attractive factors of Betawi culture were bright colors (67%), unique and attractive music (67%), and the philosophy behind Betawi culture (42%); (5) The majority of respondents (99%) stated that Betawi culture needed to be preserved; (6) The majority of respondents (71%) stated that Indonesian culture was still the most interesting compared to foreign cultures (Japanese, Korean, American). These answers could become the basis for providing solutions as an effort to increase the appreciation of Generation Z in Jakarta for Betawi culture. In the following discussion, approaches that can be taken to attract Generation Z's interest in traditional Indonesian culture in a more contemporary package are examined.

3.2. Betawi Culture in Augmented Reality (AR)

Previous studies indicate that Generation Z demonstrates an intensive engagement with mobile technology. In Indonesia, Generation Z records one of the highest daily mobile phone usage rates, reaching an average of 8.5 hours per day [19]. Rather than merely indicating technological dependency, this condition highlights mobile devices as a dominant cultural interface through which information,

values, and learning experiences are accessed by this generation. Consequently, mobile-based digital platforms present a strategic opportunity for cultural transmission and engagement. Within this context, cultural digitalization refers to the use of information and communication technologies to enhance the preservation, dissemination, and reinterpretation of cultural knowledge [20]. In Indonesia, digital cultural practices have been increasingly manifested through creative industries such as games, educational software, animation, and interactive media. This study positions augmented reality (AR) as a cultural digitalization strategy that aligns with Generation Z's media consumption patterns while offering immersive and experiential learning opportunities. Empirical data from the questionnaire further supports this design decision. The majority of respondents (86%) identified mobile phones as their primary digital device, compared to laptops (10%) and tablets (4%), indicating that smartphones are the most accessible and familiar platform for cultural media delivery. In addition, 80% of respondents reported being familiar with AR technology, suggesting that AR does not represent a technological barrier for most participants. This finding was reinforced through follow-up interviews with ten high school and university students, where nine participants demonstrated a basic understanding of AR functionality. These results indicate that AR-based cultural media can be introduced without requiring extensive technological adaptation from users.

The relevance of AR for Generation Z is further strengthened by their expressed interest in cultural content delivered through this medium. Questionnaire responses show that 91% of respondents were interested in the integration of Betawi culture into AR-based applications. Importantly, respondents' expectations emphasize holistic and immersive cultural learning, with 57% expressing a desire to learn Betawi culture comprehensively, followed by interests in traditional dances presented through animated 3D visuals (23%) and virtual interaction with traditional attire (10%). This preference pattern suggests that Generation Z does not merely seek fragmented cultural symbols but is open to engaging with cultural narratives when they are presented through interactive, visually compelling, and technologically familiar formats. These findings align with Buhalis and Karatay's characterization of Generation Z as digitally savvy individuals who adapt quickly to new technologies due to their upbringing in a high-internet and technology-rich environment [21]. However, this study extends their theoretical proposition by empirically demonstrating how such digital savviness can be mobilized for cultural learning purposes. Rather than positioning technology as an end in itself, the results indicate that AR functions as a mediating tool capable of translating Betawi cultural values into experiential formats that resonate with Generation Z's learning preferences and media habits.

3.3. The Concept and Implementation of Betawi Culture in Augmented Reality

The questionnaire results became the basis for designing an AR about Betawi culture. *Ondel-ondel* was one of the figures the respondents considered most synonymous with Betawi culture. Therefore, in the AR concept created, *ondel-ondel* was the first figure to be implemented in AR as a 3D model. Several questionnaire responses became the criteria in this AR design, one of which was bright colors. The use of striking colors typical of Betawi is able to present a culture that shows the characteristics of Betawi culture, a meeting of various foreign tribes and nations (Chinese, Dutch, Portuguese, Indian, and Arab) [22]. Based on the results of field observations, a pair of *ondel-ondel* consisting of a male and a female usually have different colors. The male *ondel-ondel* is usually red, while the female is white. The color red symbolizes spirit and courage. This is related to the original function of *ondel-ondel*, which is to ward off evil spirits. The color white symbolizes goodness and purity, synonymous with gentle motherhood. The *ondel-ondel* in this 3D AR model was created following the color concept of the *ondel-ondel* (Fig. 2). The skin color of the male *ondel-ondel* is red, while the skin color of the female is white. The male wears yellow for the top and blue for the bottom. A green scarf draped over the shoulders is one of the costume's distinctive features. The female wears a red top and green bottom, with a blue scarf. Table 2 is the color applied to the AR *ondel-ondel*.

Table 2. Colors applied to the AR *ondel-ondel*

Description	Male	Female
Skin color	Red	White
Scarf	Green	Blue
Top outfit	Yellow	Red
Bottom outfit	Blue	Green

The background of the AR featured a traditional Betawi house. This was done to accommodate respondents' suggestions, namely, to comprehensively learn about Betawi culture in this AR. Traditional Betawi houses are primarily built with wood. They are characterized by spacious terraces, which can accommodate many guests. This symbolizes the open nature of the Betawi people and their respect for all who visit their homes. Typical ornaments of traditional Betawi houses are *gigi balang* and *banji*. The *gigi balang*, a row of inverted triangles, is made of wood on the eaves of Betawi traditional houses [23][24][25]. This shape symbolizes the Betawi people's high regard for honesty and hard work. The *banji* is shaped like a sunflower, signifying a source of life and light for its inhabitants. To complement the information about *ondel-ondel* in Betawi culture, this AR will be accompanied by an audio narration of the *ondel-ondel*'s history.

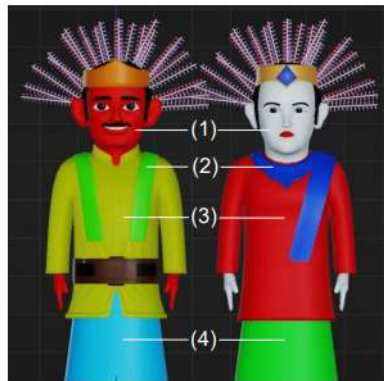


Fig. 2. Colors applied to the AR *ondel-ondel*

This AR application was named *Imaji Betawi*. The term “*Imaji*” refers to imagination as a sociocultural process through which individuals construct meaning based on symbolic representations, visual experiences, and cultural contexts [26]. In this study, imagination is not understood merely as a mental image, but as a mediated experience shaped by visual culture and digital representation. Accordingly, the name *Imaji Betawi* signifies an AR-based cultural representation that invites users to engage with Betawi culture through imaginative interpretation. Through interaction with the application, users are expected to develop an initial conceptual understanding of Betawi cultural elements and to cultivate curiosity and motivation to explore the culture further. In this sense, the naming of *Imaji Betawi* aligns with the design objectives of enhancing user experience by positioning AR as a medium that mediates cultural imagination, visual storytelling, and cultural representation [27]. The name *Imaji Betawi* is displayed on the home menu of the AR application and functions as the official application name on mobile devices. The visualization of *Imaji Betawi* on the AR application's home menu is represented by an image of a pair of *ondel-ondel* figures (a simplified depiction of the *ondel-ondel* characters featured in the AR content), the National Monument (Monas), and a background of several skyscrapers symbolizing the urban landscape of Jakarta (Fig. 3). This visual composition was intentionally selected to establish a strong Betawi cultural identity while simultaneously ensuring that the application is easily recognizable among other applications displayed on the mobile device's home screen. By combining iconic Betawi cultural symbols with contemporary urban imagery, the home menu visualization functions not only as an aesthetic element but also as a visual identity marker that facilitates immediate cultural association and enhances user recall.

The creation of AR media about Betawi culture, represented by *ondel-ondel* as the initial project, used the Unity and Vuforia as the main developer applications. These two applications were used because they could be applied to Android phones. Unity is an integrated tool for creating games, building architecture, and simulations. Unity is not made for the design or modeling process, because Unity is not a design tool [28]. Unity is a game engine that allows for the creation of 3D games quickly and easily. Vuforia is an AR Software Development Kit (SDK) that helps developers create Augmented Reality (AR) applications on mobile phones (iOS, Android). Vuforia AR provides a way of interacting that utilizes the mobile phone camera to be used as an input device, as an electronic eye that recognizes certain markers, so that the screen can display a combination of the real world and the world depicted by the application. This image registration capability allows developers to adjust the position and orientation of virtual objects, such as 3D models and other supporting media, when viewed through a mobile device's camera.



Fig. 3. Imaji Betawi interface in the AR application’s home menu

The virtual object then tracks the position and orientation of the image in real time, which then results in a virtual object displayed in the real world through the smartphone’s camera. The main steps for creating the “Imaji Betawi” AR application is presented in Fig. 4.

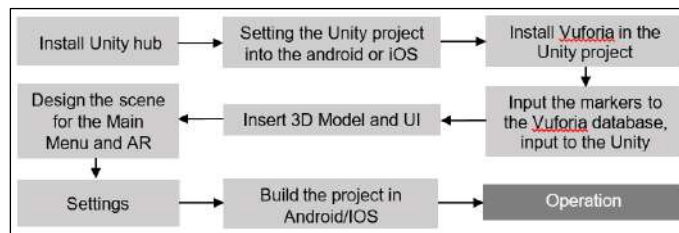


Fig. 4. Schematics of the steps for creating the Imaji Betawi AR application

After installing the Imaji Betawi AR application, users must open the QR code to gain further access. The QR code and application can be downloaded from the Google Drive, provided that it stores Imaji Betawi AR files. To operate the Imaji Betawi AR, the installed application is opened on the cellphone. After pressing the start button, the cellphone is pointed at the QR-code (scan marker), and then the *ondel-ondel* will appear along with the Betawi traditional house in the background. While operating AR Imaji Betawi, Betawi music accompaniment will be played, and its volume can be adjusted. Tapping the blue arrow on the screen plays an audio explanation of the history of *ondel-ondel*. Fig. 5 shows the operational flow of Imaji Betawi AR.



Fig. 5. Operational flow of Imaji Betawi AR

The following pictures in Fig. 6 present some visual displays of the QR code scans from the Imaji Betawi AR. By positioning the Android/iOS camera at various angles, the users can see several *ondel-ondel* positions and the background.

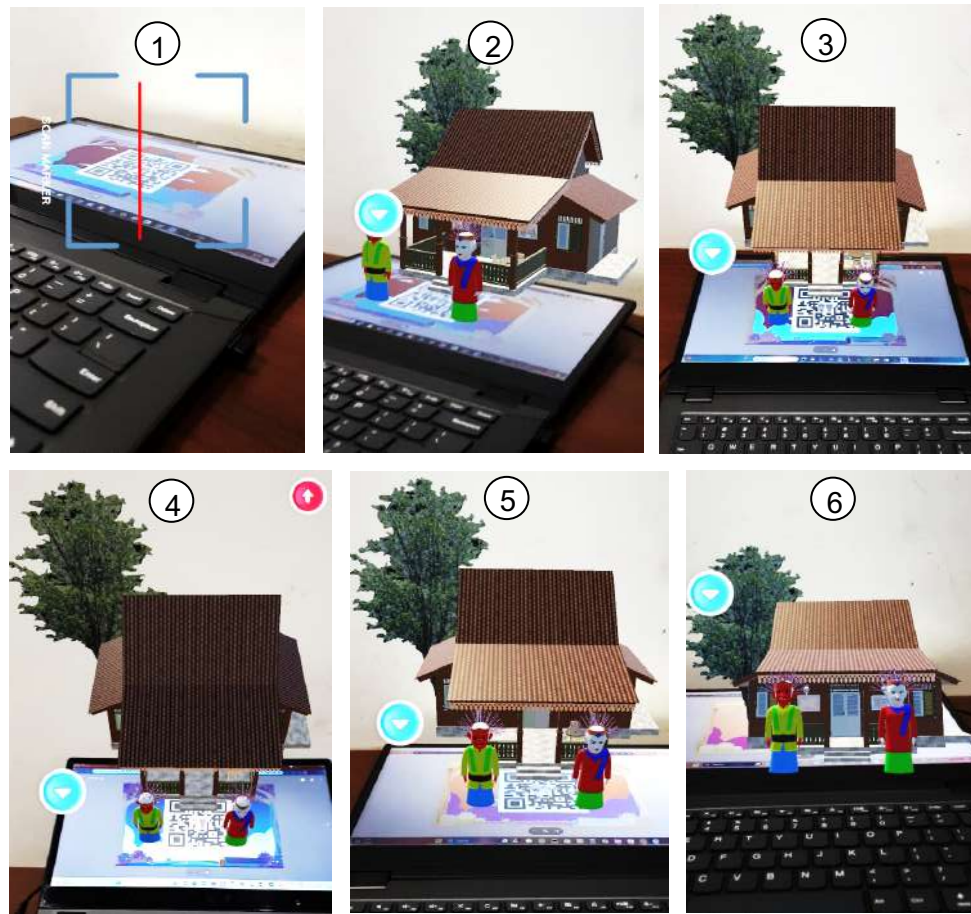


Fig. 6. Visual displays of Imaji Betawi AR

Fig. 6 (1) shows the QR-scanning process, which serves as the marker for the Imaji Betawi AR. Fig. 6 (2) to Fig. 6 (6) shows several positions of the results of the Imaji Betawi marker scan, for example, a perspective view showing all sides (2), top views (3), (4), and (5), and a front view (6). During the marker scan process, AR objects will appear as a Betawi *ondel-ondel*, a Betawi traditional house as the background, Betawi songs as the background sound, and an audio clip explaining the history of *ondel-ondel*. The volume of the background sound and explanation audio can be adjusted via the Android or iOS device.

4. Conclusion

This study reveals a critical gap between symbolic familiarity and substantive cultural understanding among Generation Z in Jakarta with regard to Betawi culture. While most respondents recognize prominent cultural symbols, particularly *ondel-ondel*, their understanding of the historical, symbolic, and socio-cultural meanings underlying these elements remains limited. Rather than assuming a direct causal relationship, this study demonstrates that such superficial recognition reflects broader patterns of mediated cultural consumption, where local culture is encountered primarily as visual symbols detached from contextual narratives. The main scientific contribution of this research lies in translating this empirical gap into a design-oriented framework by positioning user preferences as a mediating link between cultural understanding and digital learning media. By integrating sociological design principles with empirical data on Generation Z's cultural perceptions and technological familiarity, this study proposes an AR-based cultural representation model that emphasizes experiential, visually driven, and interactive learning. In this context, the development of

the Imaji Betawi AR concept is not merely a technological application but a methodological response to the identified disconnect between recognition and appreciation of local culture. The findings contribute to ongoing discussions in cultural representation, visual culture, and technology-mediated learning by illustrating how augmented reality can function as a cultural interface that reconnects symbolic imagery with contextual meaning, particularly for digitally native generations. Methodologically, this study advances an exploratory, user-preference-based approach that situates AR design within a sociocultural framework rather than treating it solely as a technical tool. Nevertheless, this study has several limitations. The findings are based on a specific demographic and geographical context, and the AR application was conceptualized rather than longitudinally evaluated for learning outcomes or behavioral change. Therefore, future research should empirically assess the effectiveness of AR-based cultural media in enhancing cultural understanding and appreciation, and conduct comparative studies across different local cultures and generational groups. This study thus serves as a conceptual and methodological foundation for future research on culturally grounded AR design and digital heritage education.

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Augmented reality for Betawi cultural representation: bridging symbolic familiarity and understanding among Generation Z



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ABSTRACT

Generation Z is widely characterized as digitally adaptive, critical, and open to cultural diversity; however, this openness also exposes them to intensive global cultural influences that may weaken engagement with local heritage. This study investigates the gap between symbolic familiarity and substantive cultural understanding of Betawi culture among Generation Z in Jakarta and examines how this gap can inform the design of technology-mediated cultural learning. Employing a design sociology approach within an exploratory mixed-method framework, this research conceptualizes design as a sociocultural mediator between cultural values, user behavior, and technological experience. Data were collected through questionnaires administered to 100 Generation Z respondents in Jakarta, complemented by observations and semi-structured interviews. The findings reveal that while respondents demonstrate high symbolic recognition of Betawi cultural icons, their understanding of historical and cultural meanings remains limited. This discrepancy indicates that cultural appreciation among Generation Z tends to be superficial and mediated by visual exposure rather than contextual knowledge. Based on these insights and respondents' strong familiarity with digital technology, this study proposes an augmented reality (AR)-based cultural representation model that translates user preferences into experiential and interactive learning media. The development of the "Imaji Betawi" AR concept represents the study's applied outcome, while its primary scientific contribution lies in framing AR as a design-based cultural interface that bridges symbolic recognition and deeper cultural understanding. This research contributes to discussions on cultural representation, visual culture, and technology-enhanced learning by demonstrating how sociologically informed design can support local cultural preservation for digitally native generations.



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1. Introduction

Advances in digital technology have significantly increased access to information and cultural content from around the world. As a globally connected generation, Generation Z actively uses social media to engage with transnational networks and global popular cultures. This condition facilitates the intensive circulation of foreign cultural influences within Indonesian society, many of which are readily embraced by Generation Z. While such exposure may enrich cultural perspectives, it simultaneously contributes to the marginalization and gradual degradation of local cultural values [1]. The rapid global diffusion of Korean popular culture (K-Pop), for example, has strongly influenced the lifestyles, consumption patterns, and aesthetic preferences of Generation Z, shaping their choices in fashion, music, food, and media [2]. If this dominance of global popular culture is not balanced by

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systematic efforts to strengthen awareness and engagement with local cultural heritage, there is a growing concern that local identities may become increasingly detached from younger generations [3]. Despite Jakarta being the cultural center of Betawi heritage, studies and digital media initiatives that specifically address how Generation Z perceives, engages with, and reimagines Betawi culture remain limited. This gap highlights the need for innovative cultural preservation strategies that align with the digital preferences of Generation Z, particularly through immersive media such as augmented reality.

This study focuses on efforts to increase the appreciation and engagement of Betawi culture among Generation Z living in DKI Jakarta. Although Betawi culture remains a significant indigenous cultural heritage in Indonesia's capital region, it continues to face erosion due to demographic shifts, globalization, and the dominance of global popular cultures. Previous research on cultural preservation and education using digital technology has demonstrated the potential of interactive media to support cultural learning. For example, immersive technologies such as augmented reality (AR) have been shown to enhance engagement with cultural heritage by providing contextualized visual information and interactive experiences [4]. Verhulst et al. stated that AR can improve cultural appreciation and recall among young users but noted limitations in addressing deep cultural meaning due to the focus on surface interaction design [5]. Similarly, Zhang et al. conducted a meta-analysis of AR applications in heritage contexts, highlighting that while AR promotes accessibility and engagement, there remains a need for user-centered design that aligns with specific audience preferences and cultural contexts [6]. However, few studies have investigated how AR can be tailored specifically to the cultural values and knowledge frameworks of Generation Z in Jakarta, particularly regarding Betawi traditions, symbols, and practices. Studies on AR in cultural education have often focused on historical sites or broad cultural heritage rather than localized, living cultures embedded in urban communities. Therefore, this study aims to fill this gap by examining how AR design, informed by the preferences of Generation Z, can be used to increase their appreciation and cultural engagement with Betawi culture.

Augmented reality (AR) has been widely applied in cultural education and heritage communication due to its ability to integrate digital content with real-world environments through interactive visual and spatial experiences. Previous studies have demonstrated that AR can support cultural dissemination and public awareness by enhancing accessibility and engagement with cultural objects and narratives [7]. In the Indonesian context, research has explored the use of AR to introduce local cultural elements, such as Betawi Gambang Kromong art as a marketing and promotional medium [8] and the visualization of traditional textiles in museum collections, such as Lampung's *kain tapis* [9].

These studies primarily positioned AR as a tool for cultural presentation and information delivery. However, they have not explicitly examined how AR design can be informed by the cultural perceptions, expectations, and learning preferences of specific user groups. The novelty of this study lies in its user-centered and sociocultural design approach, which positions Generation Z in Jakarta not only as recipients of cultural information but as active reference points in the design process. By first investigating Generation Z's understanding of Betawi cultural values and their expectations toward learning Betawi culture through AR-based media, this study integrates empirical questionnaire findings into the design and development of an AR application named "Imaji Betawi". *Imaji Betawi* is conceived as a digital cultural learning medium that represents Betawi culture through interactive AR experiences, aiming to enhance cultural imagination, engagement, and appreciation among Generation Z.

2. Method

This study employed a mixed-methods exploratory design-based research approach, grounded in a design sociology framework, to investigate how Generation Z in Jakarta perceives and engages with Betawi culture and how these social insights can inform the design of an AR-based cultural application. Rather than positioning design as a purely visual or functional outcome, the design sociology approach frames design as a sociocultural construct shaped by social behavior, cultural values, and everyday practices [10]. In this context, design is understood as part of a broader social system that mediates the relationship between users, cultural meanings, and technological representation. The design sociology framework was operationalized by examining Generation Z's cultural perceptions, media habits, and expectations toward Betawi culture, and systematically translating these social findings into design considerations for an AR application. This approach

allowed the study to bridge sociological analysis and design practice by linking empirical social data to cultural representation, user experience, and design objectives.

2.1. Data Collection

Data were collected through a combination of quantitative and qualitative methods. First, a questionnaire survey was administered to 100 Generation Z respondents living in Jakarta and its surrounding areas. The questionnaire consisted of closed-ended questions to capture demographic information, media usage patterns, and levels of familiarity with Betawi culture, as well as open-ended questions to explore respondents' expectations, interests, and perceptions regarding learning Betawi culture through AR-based media. Second, qualitative data were gathered through observations and semi-structured interviews with selected respondents. Observations focused on respondents' interactions with digital media and cultural content, while interviews were conducted to gain deeper insights into their cultural attitudes, motivations, and interpretations of Betawi cultural symbols. These qualitative methods were used to complement the survey data and to enrich the sociocultural analysis. The respondent profile based on the questionnaire is provided in Table 1.

Table 1. Respondent Profile

Category	Sub category	Number of respondents
Gender	Male	52
	Female	48
Age	12-17 years old	16
	18-20	45
	21-25	36
Age	26-28	3
Education	Junior High School	6
	Senior High School and equivalent	12
	Higher education students	82

2.2. Data Analysis

Quantitative data from the questionnaire were analyzed descriptively to identify dominant patterns related to Generation Z's media preferences, cultural awareness, and expectations toward AR-based cultural learning. Qualitative data from open-ended questionnaire responses, interviews, and observations were analyzed using thematic analysis, focusing on recurring themes related to cultural imagination, identity, engagement, and perceptions of Betawi culture. The findings from both data sets were then interpreted through the lens of the design sociology framework, linking Generation Z's social behavior and cultural perceptions with theoretical perspectives on youth culture, local identity, and mediated cultural representation.

2.3. Design Translation and Application Development

The final stage of the research involved translating the empirical findings into design criteria for the development of an AR application named "Imaji Betawi". The identified themes and preferences derived from Generation Z respondents were used as references for determining visual elements, cultural symbols, interaction design, and narrative structure within the application. In this way, the AR application functions not only as a technological artifact but also as a sociocultural medium designed to enhance cultural imagination and appreciation of Betawi culture among Generation Z.

3. Results and Discussion

Referring to the design sociology approach used in this study, the discussion focuses on matters related to Generation Z's behavior in appreciating Betawi culture. The discussion presented is divided into two focuses and scopes, namely those related to: (1) Generation Z's knowledge of Betawi culture, and (2) Betawi culture in Augmented Reality (AR).

3.1. Generation Z's knowledge of Betawi culture

Based on Indonesia's 2020 Population Census, Generation Z constitutes the largest demographic group, accounting for 27.94% of the total population, while in Jakarta, individuals born between 1997 and 2012 represent approximately 25.65% of the population [11]. This demographic composition indicates that Generation Z plays a significant role in shaping cultural consumption patterns in urban contexts. Previous studies characterize Generation Z as digital natives whose daily activities, communication styles, and knowledge acquisition are deeply embedded in digital technologies and

online platforms [12] [13]. Such technological immersion influences not only their media preferences but also their perceptions of cultural content, including local and traditional cultures. Research on youth and cultural engagement suggests that traditional culture is often perceived by younger generations as distant or less relevant when it is presented through conventional or non-interactive forms [14]. However, cultural identity itself remains a persistent social construct, as local culture continues to function as a collective and symbolic reference shaping social belonging and identity. In this context, the large proportion of Generation Z in Jakarta, combined with their strong attachment to digital media, represents both a challenge and an opportunity for local cultural preservation. While Betawi culture risks being overlooked in everyday digital consumption, these same digital characteristics provide a strategic entry point for recontextualizing local culture through interactive and immersive media. This condition underlines the academic urgency of examining how digital technologies, particularly augmented reality, can be leveraged to foster cultural engagement and appreciation among Generation Z.

The questionnaire included several items related to Betawi culture in order to assess respondents' levels of cultural familiarity and understanding. When asked whether they were familiar with Betawi culture, 92% of respondents stated that they were familiar, while 8% reported unfamiliarity. At first glance, this high level of self-reported familiarity suggests that Betawi culture remains recognizable among Generation Z in Jakarta. However, further analysis reveals a significant distinction between symbolic recognition and substantive cultural understanding. When respondents were asked to identify Betawi cultural elements they knew, 90% mentioned *ondel-ondel*, while other art forms such as *lenong* Betawi (4%), *tanjidor* (4%), Betawi mask dance (1%), and Betawi culinary heritage (1%) were far less recognized. This concentration of responses on a single iconic symbol indicates that Generation Z's familiarity with Betawi culture is largely limited to surface-level visual representation rather than a broader or deeper knowledge of its cultural diversity. This pattern becomes more evident when respondents were asked about their understanding of the historical background of the Betawi cultural elements they selected. While 67% stated that they knew the history, 33% reported that they did not, suggesting a notable gap between recognition and historical or contextual understanding. This empirical finding highlights a key problem in contemporary cultural engagement: local culture may be widely recognized symbolically but insufficiently understood in terms of meaning, history, and cultural values. Such a gap underscores the need for educational interventions and learning media that can bridge visual familiarity with deeper cultural comprehension, thereby forming a critical foundation for the development of interactive and immersive cultural learning tools, such as augmented reality-based media.

Based on the questionnaire responses, it was found that the Betawi culture most familiar to Generation Z, and perhaps even all generations, is *ondel-ondel*. This is understandable because *ondel-ondel* is an icon of Jakarta, found in almost every corner of the city. The Betawi people are the native inhabitants of Jakarta. The Betawi people are the result of intermarriage between ethnicities and nations that previously lived in Jakarta, such as Javanese, Sundanese, Arabs, Makassarese, Malays, Indians, Bugis, Ambonese, and Chinese. *Ondel-ondel* is a large Betawi puppet with its own uniqueness. Initially, it was known as *barung*, which later changed to *barongan*. In Betawi, *barongan* is interpreted as 'a group of people,' because basically, the art of *barongan* cannot be played alone [15]. From the results of interviews with five Generation Z members, it was obtained that they learned about *ondel-ondel* from frequently seeing a pair of these large puppets walking down the streets around their homes. The pair of *ondel-ondel* walked while traditional Betawi songs were playing and their purpose was to busk. The *ondel-ondel*'s busking, of course, is inconsistent with their intended function. *Ondel-ondel* is a cultural icon for the Betawi people, as stipulated in Jakarta Governor Regulation No. 11 of 2017. This regulation also outlines criteria for the use of *ondel-ondel* as a Betawi cultural icon. *Ondel-ondel* is a manifestation of ancient Betawi culture that is still easily found in remote areas of Jakarta, primarily due to its designation as a city icon. Today, *ondel-ondel* continues to thrive as a tourist attraction. At the same time, some Jakarta residents also use *ondel-ondel* for busking. These buskers include not only native Betawi but also non-Betawi residents. In Jakarta, *ondel-ondel* is often paraded around the city and even through villages. *Ondel-ondel* has been used pragmatically by the community. Today, *ondel-ondel* often perform on the streets in their bare essentials, without the usual accompaniment of musical accompaniment or a full musical ensemble. This large doll is a deformation of the human body shape, displayed with a neckless face and colorful clothing.

Ondel-ondel has experienced continuity and changes in costume elements and functions, but it is still used according to interests. *Ondel-ondel* is interesting because the costume elements and their meanings continue to change according to the social, political, economic, and cultural contexts related to the role of power in certain periods. Amid the onslaught of modernization and the rise of digital entertainment, physical *ondel-ondel* is increasingly rare. If it does exist, the function is more as a supplementary means for buskers to earn a living. This has resulted in Generation Z's limited knowledge of the true function of *ondel-ondel*. The lack of *ondel-ondel* craftsmen also makes it increasingly difficult to find *ondel-ondel* performances in Jakarta. Even if it does exist, it is only held at certain times, such as on Jakarta's anniversary and Independence Day on August 17th. Therefore, more attention is needed to maintain and preserve this traditional Betawi art form to prevent its extinction. Using technology as a medium to introduce Betawi culture and its history is a preferable choice, especially if the target is the younger generation, for example, Generation Z. Betawi culture is indeed widely known by the general public, especially the Betawi ethnic group itself. However, not everyone is aware of the history behind this culture. This is evident from the questionnaire results, which asked whether the respondents knew the history of Betawi culture, particularly Betawi arts, which they had selected in the previous question. The answers obtained were 67% stated they did not know, while 33% stated that they did. Based on interviews with five Generation Z members, their lack of knowledge about the history of Betawi arts stemmed from the rare discussions related to it on the social media platforms they typically access. Even when discussions were conducted, the presentation tended to be boring. However, formal discussions about Betawi culture are provided in Jakarta Cultural Environmental Education (*Pendidikan Lingkungan Budaya Jakarta/PLBJ*) classes during elementary and junior high school.

To enhance Generation Z's appreciation of Betawi local culture, it is essential to identify which cultural attributes resonate most strongly with them. Therefore, respondents were asked to indicate the aspects of Betawi culture they found interesting (Fig. 1), with multiple responses allowed. The results reveal a clear dominance of sensory-based attributes, particularly bright colors (67%) and attractive music (67%), followed by dynamic movements (35%). In contrast, more cognitive and reflective aspects, such as the philosophy underlying Betawi culture, were selected by a smaller proportion of respondents (42%), while linguistic characteristics, culinary traditions, and socio-cultural traits received minimal attention (each below 2%). This distribution suggests that Generation Z's engagement with Betawi culture is primarily driven by visual and auditory stimuli rather than by historical, philosophical, or linguistic dimensions. Such a pattern aligns with Generation Z's characteristics as a digitally native generation that is highly responsive to visually rich, dynamic, and immersive content. The relatively lower interest in abstract cultural meanings indicates that cognitive-cultural engagement may require mediation through appealing sensory experiences. These findings imply that cultural learning strategies targeting Generation Z should prioritize visual and audio-driven entry points, which can subsequently function as gateways to deeper cultural understanding. In this context, augmented reality-based media become particularly relevant, as they allow the integration of vivid visual elements, sound, and movement while simultaneously embedding cultural narratives and philosophical meanings within an interactive learning environment.

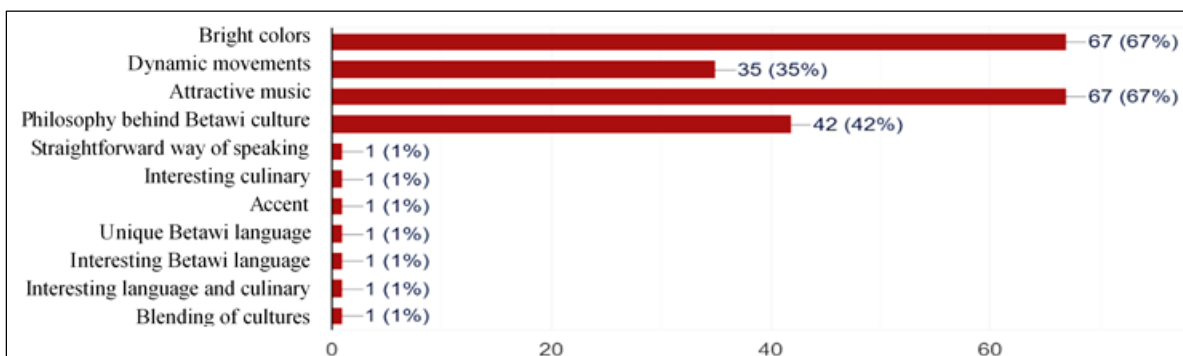


Fig. 1. Attractive factors of Betawi culture according to respondents

According to respondents, one of the attractive factors of Betawi culture is the use of bright colors. Betawi is synonymous with bright colors. These colors are applied in various aspects related to Betawi culture and arts. Betawi colors frequently used in cultural activities can be categorized based on primary, secondary, and additional neutral colors: yellow, orange, red, purple, blue, green, black, gray,

and white. The yellow category includes yellow, *kepodang* (oriole), *gading* (ivory), *kunyit* (turmeric), and *telur* (egg). In Betawi culture, red is one of the typical Betawi colors, interpreted as festivity, courage, and respect. In addition to being heavily influenced by Chinese and Hindu cultures, the Betawi people often use red in all cultural activities. Furthermore, the red face of the male *ondel-ondel* symbolizes courage and decisiveness in warding off and protecting the Betawi people from danger. In Betawi artistic performances, red is used as an invitation and adds to the festivity [16]. Contrasting color combinations (in a Betawi term, *tabrakan*, meaning collision) best describe the Betawi colors. The combination of many bright colors reflects the Betawi people's cheerfulness, assertiveness, and resilience in facing the harshness of the capital city. The simplification of some Betawi color codes into a universal color code indicates that the Betawi people are receptive and dynamic to changes around them. However, the Betawi people are also able to demonstrate their assertiveness in facing acculturation by using bright color combinations, as evidenced by their use of color in art and culture.

The attractive Betawi music is one factor that respondents found appealing. It is undeniable that Betawi music features a lively blend of musical instruments. *Gambang Kromong*, *tanjidor*, *lenong* Betawi, and the accompanying music for traditional Betawi dances all boast energetic rhythms. *Gambang Kromong* music in Betawi society represents a fusion of several cultures interacting with each other (acculturation). This can be seen in the various instruments used in the ensemble, such as Chinese string and wind instruments, Sundanese drums, and Javanese *gambang*, *kromong*, *kempul*, *kecrek*, and gong [17]. *Tanjidor* serves as a form of entertainment for the community. Therefore, the Betawi people refer to this *tanjidor* art form as the *tanjidor* orchestra. *Tanjidor* predominantly uses wind instruments [18]. The philosophy behind Betawi culture was the next most appealing factor according to the respondents, after color and music. Betawi cultural philosophy is defined as everything related to the results of human activity and reason (the Betawi people), one of which is Betawi art. This was what the respondents who completed the questionnaire found interesting. Therefore, it can be concluded that Generation Z is interested in understanding the background of Betawi culture, including its art. When asked about the need to preserve Betawi culture, 99% of respondents stated it was necessary, while 1% stated it was not necessary. This figure indicates that Generation Z still has a high level of concern for the preservation of local Indonesian culture, including Betawi culture. However, various efforts are needed to increase Generation Z's awareness of Betawi culture, which should be done through approaches that resonate with them.

The final question in the questionnaire, related to Betawi culture, asked respondents to choose which culture they considered most appealing among the following cultures: Korean, Japanese, American, and Indonesian. The answers from Generation Z are as follows: 71% chose Indonesian culture, 21% Japanese culture, 5% Korean culture, and 3% American culture. These answers were beyond prediction considering the strong influence of foreign cultures that they like and are often uploaded to social media. Thus, for Generation Z, Indonesian culture is still considered the most interesting, even though in their daily lives they adapt foreign cultures (for example, Korean), starting from the way they dress, appearance, culinary, to the use of language. This is an indicator that there is still an opportunity to increase Jakarta Generation Z's appreciation for Betawi Culture. Based on the questionnaire responses related to Generation Z's knowledge of Betawi culture, the following conclusions were drawn. (1) The majority of respondents (92%) were familiar with Betawi culture; (2) Betawi culture, especially art, which was most familiar to Generation Z was *ondel-ondel* (90%); (3) The majority of respondents (67%) admitted that they did not know the history of Betawi culture; (4) The attractive factors of Betawi culture were bright colors (67%), unique and attractive music (67%), and the philosophy behind Betawi culture (42%); (5) the majority of respondents (99%) stated that Betawi culture needed to be preserved; (6) The majority of respondents (71%) stated that Indonesian culture was still the most interesting compared to foreign cultures (Japanese, Korean, American). These answers could become the basis for providing solutions as an effort to increase the appreciation of Generation Z in Jakarta for Betawi culture. In the following discussion, approaches that can be taken to attract Generation Z's interest in traditional Indonesian culture in a more contemporary package are examined.

3.2. Betawi Culture in Augmented Reality (AR)

Previous studies indicate that Generation Z demonstrates an intensive engagement with mobile technology. In Indonesia, Generation Z records one of the highest daily mobile phone usage rates, reaching an average of 8.5 hours per day [19]. Rather than merely indicating technological dependency, this condition highlights mobile devices as a dominant cultural interface through which information,

values, and learning experiences are accessed by this generation. Consequently, mobile-based digital platforms present a strategic opportunity for cultural transmission and engagement. Within this context, cultural digitalization refers to the use of information and communication technologies to enhance the preservation, dissemination, and reinterpretation of cultural knowledge [20]. In Indonesia, digital cultural practices have been increasingly manifested through creative industries such as games, educational software, animation, and interactive media. This study positions augmented reality (AR) as a cultural digitalization strategy that aligns with Generation Z's media consumption patterns while offering immersive and experiential learning opportunities. Empirical data from the questionnaire further supports this design decision. The majority of respondents (86%) identified mobile phones as their primary digital device, compared to laptops (10%) and tablets (4%), indicating that smartphones are the most accessible and familiar platform for cultural media delivery. In addition, 80% of respondents reported being familiar with AR technology, suggesting that AR does not represent a technological barrier for most participants. This finding was reinforced through follow-up interviews with ten high school and university students, where nine participants demonstrated a basic understanding of AR functionality. These results indicate that AR-based cultural media can be introduced without requiring extensive technological adaptation from users.

The relevance of AR for Generation Z is further strengthened by their expressed interest in cultural content delivered through this medium. Questionnaire responses show that 91% of respondents were interested in the integration of Betawi culture into AR-based applications. Importantly, respondents' expectations emphasize holistic and immersive cultural learning, with 57% expressing a desire to learn Betawi culture comprehensively, followed by interests in traditional dances presented through animated 3D visuals (23%) and virtual interaction with traditional attire (10%). This preference pattern suggests that Generation Z does not merely seek fragmented cultural symbols but is open to engaging with cultural narratives when they are presented through interactive, visually compelling, and technologically familiar formats. These findings align with Buhalis and Karatay's characterization of Generation Z as digitally savvy individuals who adapt quickly to new technologies due to their upbringing in a high-internet and technology-rich environment [21]. However, this study extends their theoretical proposition by empirically demonstrating how such digital savviness can be mobilized for cultural learning purposes. Rather than positioning technology as an end in itself, the results indicate that AR functions as a mediating tool capable of translating Betawi cultural values into experiential formats that resonate with Generation Z's learning preferences and media habits.

3.3. The Concept and Implementation of Betawi Culture in Augmented Reality

The questionnaire results became the basis for designing an AR about Betawi culture. *Ondel-ondel* was one of the figures the respondents considered most synonymous with Betawi culture. Therefore, in the AR concept created, *ondel-ondel* was the first figure to be implemented in AR as a 3D model. Several questionnaire responses became the criteria in this AR design, one of which was bright colors. The use of striking colors typical of Betawi is able to present a culture that shows the characteristics of Betawi culture, a meeting of various foreign tribes and nations (Chinese, Dutch, Portuguese, Indian, and Arab) [22]. Based on the results of field observations, a pair of *ondel-ondel* consisting of a male and a female usually have different colors. The male *ondel-ondel* is usually red, while the female is white. The color red symbolizes spirit and courage. This is related to the original function of *ondel-ondel*, which is to ward off evil spirits. The color white symbolizes goodness and purity, synonymous with gentle motherhood. The *ondel-ondel* in this 3D AR model was created following the color concept of the *ondel-ondel* (Fig. 2). The skin color of the male *ondel-ondel* is red, while the skin color of the female is white. The male wears yellow for the top and blue for the bottom. A green scarf draped over the shoulders is one of the costume's distinctive features. The female wears a red top and green bottom, with a blue scarf. Table 2 is the color applied to the AR *ondel-ondel*.

Table 2. Colors applied to the AR *ondel-ondel*

Description	Male	Female
Skin color	Red	White
Scarf	Green	Blue
Top outfit	Yellow	Red
Bottom outfit	Blue	Green

The background of the AR featured a traditional Betawi house. This was done to accommodate respondents' suggestions, namely, to comprehensively learn about Betawi culture in this AR. Traditional Betawi houses are primarily built with wood. They are characterized by spacious terraces, which can accommodate many guests. This symbolizes the open nature of the Betawi people and their respect for all who visit their homes. Typical ornaments of traditional Betawi houses are *gigi balang* and *banji*. The *gigi balang*, a row of inverted triangles, is made of wood on the eaves of Betawi traditional houses [23][24][25]. This shape symbolizes the Betawi people's high regard for honesty and hard work. The *banji* is shaped like a sunflower, signifying a source of life and light for its inhabitants. To complement the information about *ondel-ondel* in Betawi culture, this AR will be accompanied by an audio narration of the *ondel-ondel*'s history.

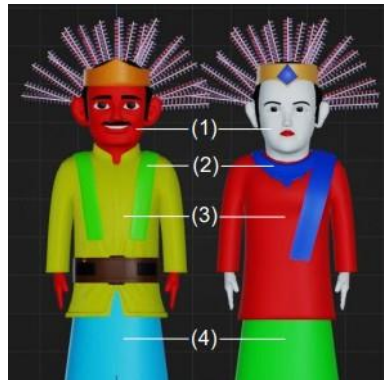


Fig. 2. Colors applied to the AR *ondel-ondel*

This AR application was named *Imaji Betawi*. The term “*Imaji*” refers to imagination as a sociocultural process through which individuals construct meaning based on symbolic representations, visual experiences, and cultural contexts [26]. In this study, imagination is not understood merely as a mental image, but as a mediated experience shaped by visual culture and digital representation. Accordingly, the name *Imaji Betawi* signifies an AR-based cultural representation that invites users to engage with Betawi culture through imaginative interpretation. Through interaction with the application, users are expected to develop an initial conceptual understanding of Betawi cultural elements and to cultivate curiosity and motivation to explore the culture further. In this sense, the naming of *Imaji Betawi* aligns with the design objectives of enhancing user experience by positioning AR as a medium that mediates cultural imagination, visual storytelling, and cultural representation [27]. The name *Imaji Betawi* is displayed on the home menu of the AR application and functions as the official application name on mobile devices. The visualization of *Imaji Betawi* on the AR application's home menu is represented by an image of a pair of *ondel-ondel* figures (a simplified depiction of the *ondel-ondel* characters featured in the AR content), the National Monument (Monas), and a background of several skyscrapers symbolizing the urban landscape of Jakarta (Fig. 3). This visual composition was intentionally selected to establish a strong Betawi cultural identity while simultaneously ensuring that the application is easily recognizable among other applications displayed on the mobile device's home screen. By combining iconic Betawi cultural symbols with contemporary urban imagery, the home menu visualization functions not only as an aesthetic element but also as a visual identity marker that facilitates immediate cultural association and enhances user recall.

The creation of AR media about Betawi culture, represented by *ondel-ondel* as the initial project, used the Unity and Vuforia as the main developer applications. These two applications were used because they could be applied to Android phones. Unity is an integrated tool for creating games, building architecture, and simulations. Unity is not made for the design or modeling process, because Unity is not a design tool [28]. Unity is a game engine that allows for the creation of 3D games quickly and easily. Vuforia is an AR Software Development Kit (SDK) that helps developers create Augmented Reality (AR) applications on mobile phones (iOS, Android). Vuforia AR provides a way of interacting that utilizes the mobile phone camera to be used as an input device, as an electronic eye that recognizes certain markers, so that the screen can display a combination of the real world and the world depicted by the application. This image registration capability allows developers to adjust the position and orientation of virtual objects, such as 3D models and other supporting media, when viewed through a mobile device's camera.



Fig. 3. Imaji Betawi interface in the AR application's home menu

The virtual object then tracks the position and orientation of the image in real time, which then results in a virtual object displayed in the real world through the smartphone's camera. The main steps for creating the "Imaji Betawi" AR application is presented in Fig. 4.

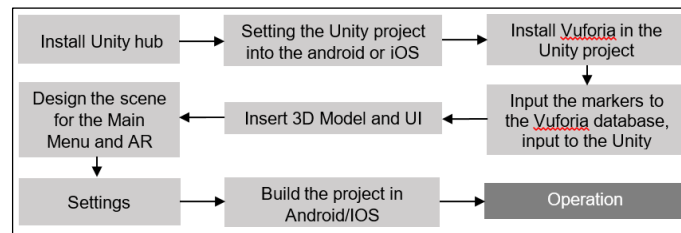


Fig. 4. Schematics of the steps for creating the Imaji Betawi AR application

After installing the Imaji Betawi AR application, users must open the QR code to gain further access. The QR code and application can be downloaded from the Google Drive, provided that it stores Imaji Betawi AR files. To operate the Imaji Betawi AR, the installed application is opened on the cellphone. After pressing the start button, the cellphone is pointed at the QR-code (scan marker), and then the *ondel-ondel* will appear along with the Betawi traditional house in the background. While operating AR Imaji Betawi, Betawi music accompaniment will be played, and its volume can be adjusted. Tapping the blue arrow on the screen plays an audio explanation of the history of *ondel-ondel*. Fig. 5 shows the operational flow of Imaji Betawi AR.

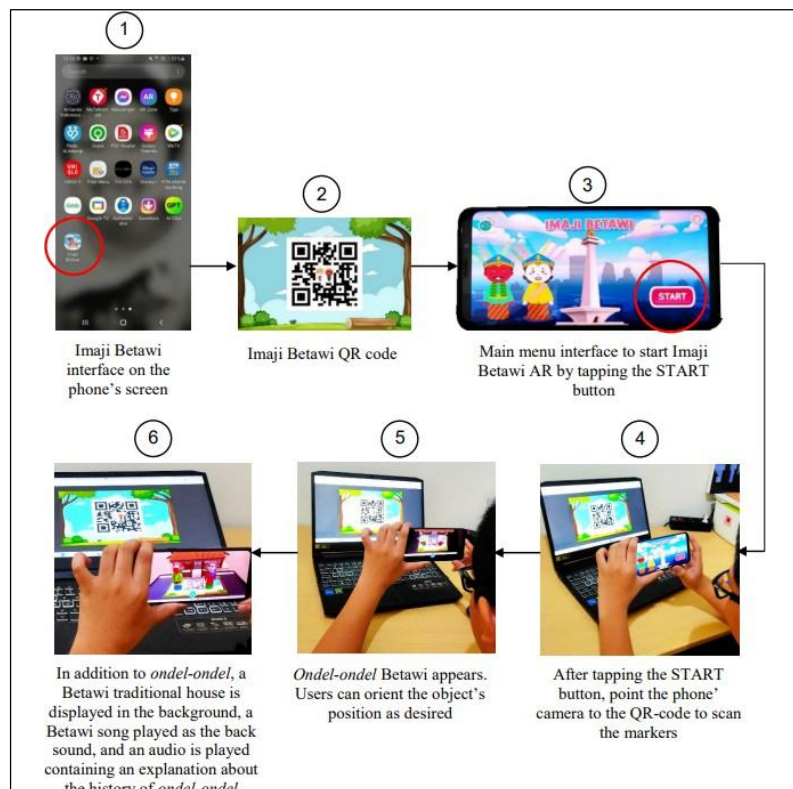


Fig. 5. Operational flow of Imaji Betawi AR

The following pictures in Fig. 6 present some visual displays of the QR code scans from the Imaji Betawi AR. By positioning the Android/iOS camera at various angles, the users can see several *ondel-ondel* positions and the background.

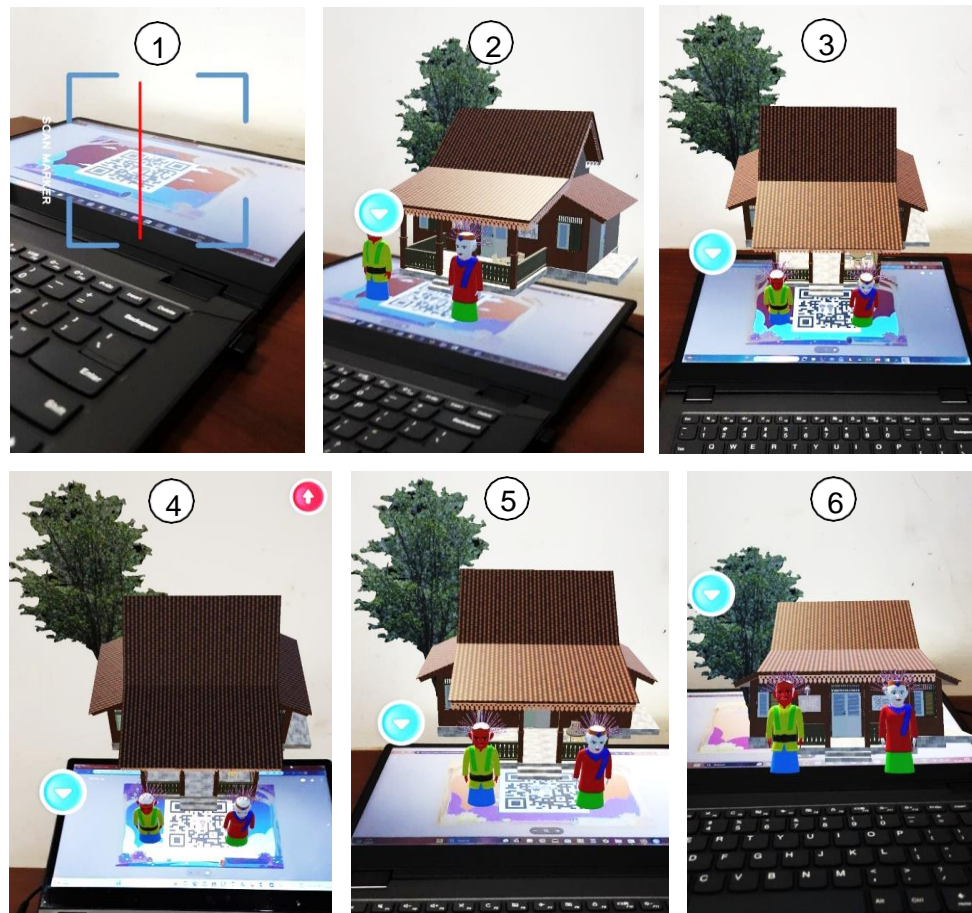


Fig. 6. Visual displays of Imaji Betawi AR

Fig. 6 (1) shows the QR-scanning process, which serves as the marker for the Imaji Betawi AR. Fig. 6 (2) to Fig. 6 (6) shows several positions of the results of the Imaji Betawi marker scan, for example, a perspective view showing all sides (2), top views (3), (4), and (5), and a front view (6). During the marker scan process, AR objects will appear as a Betawi *ondel-ondel*, a Betawi traditional house as the background, Betawi songs as the background sound, and an audio clip explaining the history of *ondel-ondel*. The volume of the background sound and explanation audio can be adjusted via the Android or iOS device.

4. Conclusion

This study reveals a critical gap between symbolic familiarity and substantive cultural understanding among Generation Z in Jakarta with regard to Betawi culture. While most respondents recognize prominent cultural symbols, particularly *ondel-ondel*, their understanding of the historical, symbolic, and socio-cultural meanings underlying these elements remains limited. Rather than assuming a direct causal relationship, this study demonstrates that such superficial recognition reflects broader patterns of mediated cultural consumption, where local culture is encountered primarily as visual symbols detached from contextual narratives. The main scientific contribution of this research lies in translating this empirical gap into a design-oriented framework by positioning user preferences as a mediating link between cultural understanding and digital learning media. By integrating sociological design principles with empirical data on Generation Z's cultural perceptions and technological familiarity, this study proposes an AR-based cultural representation model that emphasizes experiential, visually driven, and interactive learning. In this context, the development of

the Imaji Betawi AR concept is not merely a technological application but a methodological response to the identified disconnect between recognition and appreciation of local culture. The findings contribute to ongoing discussions in cultural representation, visual culture, and technology-mediated learning by illustrating how augmented reality can function as a cultural interface that reconnects symbolic imagery with contextual meaning, particularly for digitally native generations. Methodologically, this study advances an exploratory, user-preference-based approach that situates AR design within a sociocultural framework rather than treating it solely as a technical tool. Nevertheless, this study has several limitations. The findings are based on a specific demographic and geographical context, and the AR application was conceptualized rather than longitudinally evaluated for learning outcomes or behavioral change. Therefore, future research should empirically assess the effectiveness of AR-based cultural media in enhancing cultural understanding and appreciation, and conduct comparative studies across different local cultures and generational groups. This study thus serves as a conceptual and methodological foundation for future research on culturally grounded AR design and digital heritage education.

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