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MORALITY BEFORE KNOWLEDGE

# Millennial tourists' perceptions regarding the implementation of smart tourism at the national museum of Indonesia

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## ABSTRACT

**Background:** Jakarta, as the nation's capital, has great potential in developing historical and cultural tourism. One place that has undergone transformation is the National Museum of Indonesia, which is currently implementing digital technology through the concept of smart tourism. **Methods:** This study uses a quantitative approach with descriptive methods. Data were obtained by distributing questionnaires to millennial tourists who have visited the museum and used the available digital facilities. **Findings:** Technologies such as augmented reality, video mapping, and other interactive features are used to enhance the visitor experience. This study aims to determine how millennial tourists perceive the implementation of smart tourism at the National Museum of Indonesia. **Conclusion:** The results show that millennial tourists responded positively to the implementation of technology, especially in terms of information clarity and interactivity. However, there are still several things that need to be improved, such as personalization of the experience and ease of access to digital features. **Novelty/Originality of this article:** These findings can be input for museum managers in developing a smart tourism concept that is more suited to visitor needs. In addition, this study also adds to the reference study on the application of technology in managing cultural destinations in Indonesia.

**KEYWORDS**: Indonesian national museum; millennial generation; smart tourism; tourist perception.

## 1. Introduction

As the nation's capital and the center of government and the national economy, Jakarta plays a strategic role not only as an administrative center but also as the main gateway for Indonesian tourism. The city offers a rich variety of attractions, ranging from historical sites such as the Old Town area, cultural attractions in *Setu* Babakan, world-class shopping in modern malls, to culinary tourism and a growing nightlife scene. Jakarta's diverse tourist attractions make it a top destination for both local and international tourists. According to a report by the Central Statistics Agency/*Badan Pusat Statistik* (BPS) of DKI Jakarta Province (2024), the number of foreign tourist visits to Jakarta in 2023 reached 1,963,059, a significant increase compared to the previous year and indicating a recovery trend following the COVID-19 pandemic. Jakarta's excellence as a global destination is further

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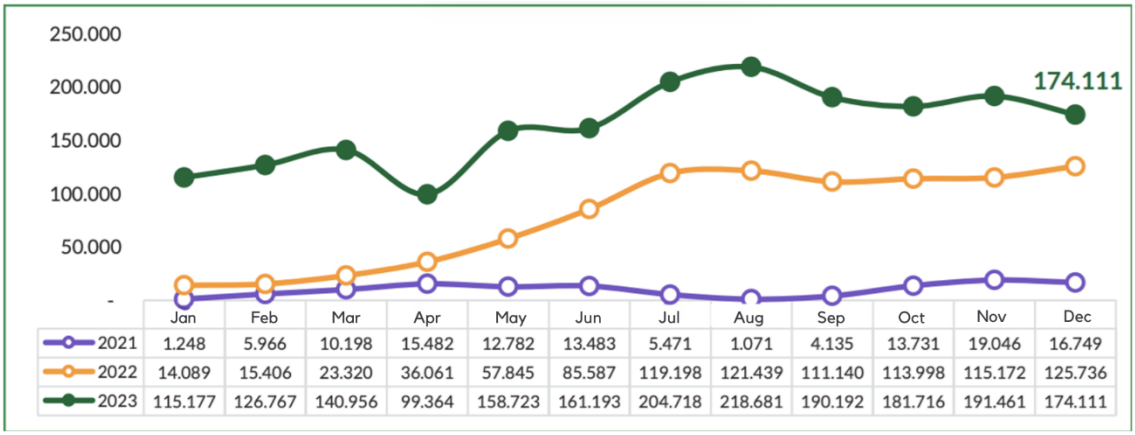
recognized internationally after being named one of the "Best Cities to Visit in 2024" by Lonely Planet, a leading US travel publication. In the list, Jakarta ranked 7th out of the world's 10 best cities recommended for visitors, surpassing major cities such as Prague and Kansas (Ministry of Tourism and Creative Economy, 2023). This achievement confirms that Jakarta is not only superior in the business and bureaucratic fields, but is also increasingly being considered as a world-class tourism destination.




| | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 2021 | 1.248 | 5.966 | 10.198 | 15.482 | 12.782 | 13.483 | 5.471 | 1.071 | 4.135 | 13.731 | 19.046 | 16.749 |
| 2022 | 14.089 | 15.406 | 23.320 | 36.061 | 57.845 | 85.587 | 119.198 | 121.439 | 111.140 | 113.998 | 115.172 | 125.736 |
| 2023 | 115.177 | 126.767 | 140.956 | 99.364 | 158.723 | 161.193 | 204.718 | 218.681 | 190.192 | 181.716 | 191.461 | 174.111 |

Fig. 1. Development of the number of international tourist visits to Jakarta, 2021-2023 (Central Statistics Agency of DKI Jakarta Province, 2024)

The National Museum of Indonesia, also known as the Elephant Museum, is an iconic cultural destination located in downtown Jakarta. It is one of the oldest and largest institutions in Southeast Asia, with a history dating back to the founding of the *Bataviaasch Genootschap van Kunsten en Wetenschappen* by the Dutch colonial government in 1778. According to the National Museum's official website, the museum has evolved into a center for the preservation of national cultural heritage, with a collection of over 140,000 artifacts spanning archeology, ethnography, geography, history, prehistory, and numismatics. In an effort to modernize the destination and increase its tourist appeal, the National Museum underwent a major revitalization process from 2023 to mid-2024. This update included gallery renovations, public facility upgrades, and the integration of digital technologies such as augmented reality, video mapping, and interactive exhibitions. Furthermore, several installations have begun to adopt artificial intelligence (AI) technology to present voice-based narratives and content recommendations tailored to visitors' interests, creating a more personalized and adaptive experience. The museum was officially reopened by the Indonesian Heritage Agency on October 15, 2024, marking the transformation of a conventional museum into a more immersive, technological, and data-driven educational space. This step is part of the initial implementation of the smart tourism concept, which combines digital innovation with the preservation of local cultural narratives. As a preliminary indicator before the era of digitalization and museum reopening, the National Museum recorded 399,220 visitors in 2022, demonstrating post-pandemic recovery and increasing public interest in educational and cultural tourism.

The concept of smart tourism is currently understood as an integrated approach to tourism destination development where information and communication technology is used to create more adaptive, efficient, and user-centered experiences (Gretzel et al., 2015). In its development, smart tourism relies not only on digital applications or online sites but also encompasses critical elements such as interconnected systems, human-machine interaction (IoT), and strategic information management (Shafiee et al., 2022). This technology enables destination managers to provide real-time, personalized services based on visitor preferences. One innovation currently in the spotlight is the application of artificial intelligence (AI) and service automation, which is believed to change tourist consumption patterns, especially among the millennial generation, who are highly familiar with technology (Tussyadiah, 2020). The National Museum of Indonesia, which has now

adopted technologies such as augmented reality, AI-based interaction, and interactive digital exhibitions, reflects the concrete application of smart experience elements in cultural spaces. Not only does this innovation enhance the museum's appeal, it also makes the visit more informative, responsive, and relevant to today's visitor preferences.

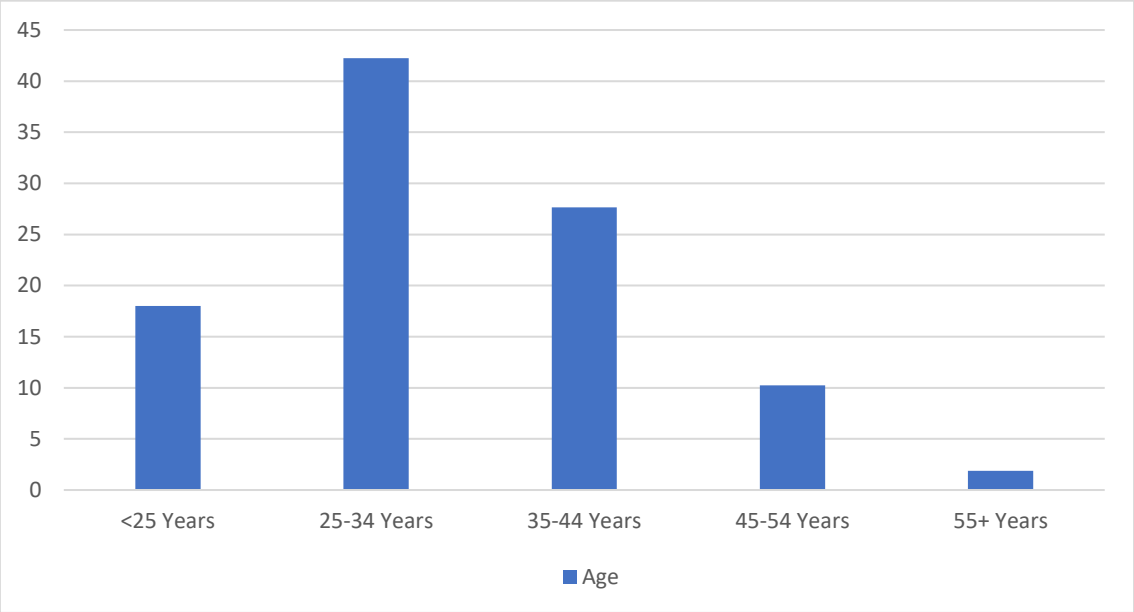



Fig. 2. Proportion of domestic tourist trips by age group 2023

The millennial generation is now a highly influential group in domestic tourism trends. According to a report from the Central Statistics Agency (2024), the majority of domestic tourists in 2023 will be between the ages of 25 and 44. This age group is generally associated with the millennial generation, those born between 1980 and 2000. This generation is closely associated with digital technology; they are accustomed to using smartphones and social media throughout almost the entire travel process, from planning to sharing experiences after visiting. Furthermore, millennials show a preference for destinations that are not solely visually appealing, but also offer elements of authenticity, sustainability, and experiences that differentiate them from most mainstream tourist destinations.

Given this trend, a smart tourism approach is an appropriate strategy, combining information technology, easy access, interactive services, and experiences tailored to visitor needs (Gretzel et al., 2015). However, the success of smart tourism implementation cannot be separated from how tourists themselves perceive the experience. In this regard, perception plays a crucial role. Perception is formed through the interaction of internal factors within visitors, such as background, personal experience, and knowledge, with various external stimuli they encounter during their visit, such as the quality of information or the presentation of tourist attractions. Consequently, understanding millennial tourists' perceptions of smart tourism applications, particularly in cultural destinations like the National Museum of Indonesia, is a crucial step in assessing the extent to which destination digitalization can meet the expectations and needs of this generation.

In recent years, discussions on smart tourism have continued to grow, particularly in relation to the use of technology in the tourism sector (Akib, 2020). However, most studies still focus on high-tech tourist destinations, such as smart cities and large-scale digital tourist attractions. This leaves ample room to explore how smart tourism is implemented in cultural destinations like museums, particularly in Indonesia, a developing country beginning to transition towards digital transformation. Several recent studies have shown that the implementation of smart tourism technologies (STTs) can enhance the quality of museum visits by creating more emotionally immersive experiences and increasing visitor engagement (Yang & Zhang, 2022; Zhang & Rahman, 2022). For millennials, accustomed to technology in their daily lives, the presence of interactive and digital elements in museums

not only enhances comfort but also encourages loyalty and repeat visits. However, research directly examining this generation's perceptions of museum digitalization in Indonesia is still very limited. Yet, the characteristics of millennials, who tend to seek authentic, personalized, and technology-based experiences, make them a highly potential market segment. Research by Ismail et al. (2025) in Malaysia demonstrates the importance of understanding millennial expectations in the context of smart museums, as a guide for designing more innovative cultural destination management. The lack of similar studies on national cultural institutions such as the National Museum of Indonesia indicates the need for further research to fill the existing academic gap.

The application of technology in museums needs to be examined from the perspective of visitors who directly experience it. Millennials, known for their close relationship with digital developments, are a relevant group to study in this context. However, studies specifically highlighting their perceptions of the use of smart tourism in Indonesian museums are still very limited. Therefore, this study aims to understand how millennial tourists respond to the presence of interactive technologies, such as augmented reality, video mapping, and other digital features implemented at the National Museum of Indonesia. This focus was chosen because millennials play a significant role in domestic tourism trends and tend to appreciate personalized, innovative, and technology-based tourism experiences.

## 2. Methods

### *2.1 Research design and location*

A descriptive quantitative approach was used to determine millennial tourists' perceptions of smart tourism implementation at the National Museum of Indonesia, Jakarta. This approach was chosen because it allowed researchers to systematically measure and describe perceptual trends based on numerical data. The research was conducted online in May 2025, in line with the increasing use of digital technology in museum services.

### *2.2 Population, sample, and data collection techniques*

The population in this study were millennial tourists, individuals born between 1980 and 2000 who had visited the National Museum of Indonesia after its revitalization. The sample was selected using a purposive sampling technique, which intentionally determines respondents based on certain criteria, namely age and experience using smart tourism facilities such as QR codes, interactive technology, or augmented reality (AR). The number of respondents collected was 65 people. Data collection was carried out using an online survey distributed through Google Forms. The questionnaire contained statements related to respondents' perceptions of smart tourism facilities at the National Museum. Respondents filled out the questionnaire voluntarily through a link shared through social media and the researcher's personal network.

### *2.3 Research instruments and data analysis techniques*

The main tool in this study was a closed questionnaire consisting of two main groups: External dimensions, which include indicators such as color appearance, unique elements, visual stimulation strength, movement elements, and novelty aspects. Internal dimensions, including aspects of experience or knowledge, individual background, information needs, motivation to visit, and mood when interacting in the museum. Each indicator is described in the form of several statements, and respondents were asked to rate each statement using a Likert scale of 1 to 5, where: 1 indicates strongly disagree, and 5 indicates strongly agree.

The items in this questionnaire were compiled based on theoretical references from previous studies that discussed tourists' perceptions of the application of technology in digital tourism or smart tourism. The data obtained from the questionnaire were analyzed

using descriptive statistics. The analysis was conducted by calculating the minimum, maximum, and average (mean) values for each indicator to determine patterns or trends in respondents' perceptions of each aspect of smart tourism. All data processing was carried out using software such as Microsoft Excel, which was also used to organize the data into tabular displays for easier understanding and comparison.

## 3. Result and Discussion

### *3.1 Tourist and tourism attraction*

Tourism is known as a complex and comprehensive activity, encompassing social, cultural, economic, and environmental aspects. As stated in Law of the Republic of Indonesia Number 10 of 2009, tourism is defined as a travel activity undertaken by one or more individuals to a destination for enjoyment, personal development, or to explore unique features within a specific timeframe and is only temporary. In general, tourism can be defined as the activity of traveling from one's place of origin to another destination, but only temporarily. Tourism can be classified based on various dimensions. Based on purpose, tourism is divided into recreational, cultural, medical, business, and educational tourism. Based on geographic reach, tourism is divided into domestic and international. Meanwhile, based on duration, tourism can be short-term or long-term. This classification facilitates understanding of tourist behavior and supports the development of appropriate destination development strategies. In tourism studies, tourist motivation theory is often examined using a push and pull factors approach (Faturrachman et al., 2024). This theory explains that tourist motivation is influenced by push factors that come from within oneself, such as the need for relaxation, trying new things, and self-development, as well as pull factors related to the external attractions of the destination, such as natural beauty, local culture, and available facilities.

According to Damayanti & Puspitasari (2024), tourist attractions can be categorized into three main aspects: the presence of interesting objects to see (something to see), the presence of interesting activities to do (something to do), and the presence of a product to buy (something to buy). These three aspects complement each other in providing a comprehensive tourism experience that can satisfy visitors. In the digital era, tourists' perceptions of tourist attractions are also influenced by reviews and information available online. Therefore, destination managers need to pay attention to their digital reputation and ensure that information available online reflects the quality and uniqueness of the tourist attractions offered. The combination of unique attractions, quality services, community participation, and a good digital reputation will create an attractive and sustainable destination, able to meet tourist expectations.

### *3.2 Museum and museum technology*

Zubitashvili (2024) stated that museums function not only as places for preserving artifacts, but also as institutions that adapt quickly to the process of globalization, attracting both local and international visitors, and contributing significantly to the development of cultural tourism. Technological developments have encouraged museums to adopt innovative approaches in presenting information and visitor experiences. Robaina-Calderín et al. (2023) stated that immersive experiences, such as the use of virtual reality (VR), have a positive impact on psychological engagement and visitor enjoyment. This suggests that technology integration in museums can increase their appeal and relevance in the digital age. Suryawan et al. (2025) identified that living museums that implement sustainability strategies, such as the preservation of cultural assets, environmentally friendly practices, and community participation, can increase visitor engagement while ensuring the preservation of cultural heritage. Overall, museums have undergone a transformation from conservative institutions to dynamic spaces that combine cultural preservation, education, technological innovation, and community participation.

The development of information and communication technology (ICT) has transformed the tourism industry, creating a new paradigm known as smart tourism. This concept integrates modern technologies such as virtual reality (VR), massive data, artificial intelligence (AI), and smart device networks (IoT) to optimize operational performance, enrich the tourist experience, and support data-driven decision-making (Sulistiyanta et al., 2025). Yulianti et al. (2024) argue that the adoption of ICT in tourism not only changes destination management systems but also influences the behavior and expectations of modern tourists. The application of digital technology in tourism covers various aspects, from destination promotion through social media to the development of mobile applications that can provide real-time information on weather, safe routes, and safety guidelines for tourists in high-risk destinations.

### *3.3 The development of digitalization in the tourism industry*

The development of digitalization has catalyzed transformation in the tourism industry, changing the way destinations are designed, promoted, and experienced by tourists. Tourism digitalization encompasses the integration of digital technology throughout the industry's value chain, from destination promotion to the on-site tourist experience. Ichsan et al. (2024) stated that implementing digitalization in destinations is a key strategy in developing tourism promotion in Indonesia, utilizing technologies such as e-commerce, social media, and virtual reality to enhance the attractiveness and accessibility of tourist destinations. The implementation of digital technology in tourism extends beyond promotion to include providing information and services to tourists. This demonstrates the crucial role of digitalization in maximizing operational optimization and enhancing the tourist experience. Furthermore, digitalization even opens up opportunities for the development of community-based tourism. Widyanaputri et al. (2024) revealed that digitalizing tourist villages through website development can optimize the promotion of tourism and local culture, as well as increase community participation in destination management. This demonstrates that digitalization can strengthen the role of local communities and encourage inclusive and long-term tourism development.

### *3.4 Tourist perception and smart tourism*

Tourist perception is a cognitive process involving an individual's interpretation of stimuli received during a tourism experience. This process is influenced by internal factors, such as motivation, values, and previous experiences, as well as external factors, such as available information, environmental conditions, and social interactions. According to research by Saputra et al. (2024), there are aspects known as the 4As, which can influence tourist perceptions of a tourist destination: attraction, accessibility, amenities, and ancillary services. This study shows that positive perceptions of these four components contribute to tourist satisfaction and loyalty to the tourist destination. Furthermore, tourist perceptions are also influenced by factors such as service quality, environmental cleanliness, security, and destination sustainability. This emphasizes the importance of destination management that focuses on quality and sustainability to create positive perceptions among tourists.

Smart tourism is an evolution of the concepts of e-tourism and digital tourism, integrating advanced information and communication technology (ICT) to enhance the tourist experience and maximize the sustainability of the tourism sector as a whole. This concept encompasses not only the digitalization of tourism business processes but also a comprehensive transformation involving the use of technologies such as virtual reality (VR), big data, artificial intelligence (AI), augmented reality (AR), and the internet of things (IoT) to create intelligent tourist destinations that are responsive to the needs of modern travelers (Galvão et al., 2025). Smart tourism evolved from the concept of smart cities, focusing on technology integration to improve service quality, tourist experience, and destination management efficiency. The implementation of smart tourism encompasses various aspects, such as the development of mobile applications for destination

information, online reservation systems, the use of sensors to monitor tourist flows, and interactive platforms that allow tourists to interact with their surroundings in real time. This technology enables destinations to collect and analyze tourist data, which is then used to improve services, plan more optimal promotional and marketing strategies, and manage resources sustainably.

### *3.5 Millennials*

The millennial generation, generally encompassing individuals born between 1981 and 1996, has become a dominant segment in the global tourism industry. In Indonesia, this generation comprises approximately 38.56% of the total population, making it a significant demographic in determining travel trends and preferences (Anggani & Febrianto, 2025). Unique characteristics of millennials, such as reliance on digital technology, a desire for authentic experiences, and awareness of sustainability issues, influence how they plan and enjoy travel. Millennial travelers utilize digital platforms such as social media and travel apps to plan, book, and share travel experiences. This reliance on technology not only influences how they access information but also shapes their expectations of services and facilities at tourist destinations. Millennial travelers expect easy access to information, good connectivity, and services that are responsive to their dynamic needs. Awareness of sustainability issues is also a characteristic of the millennial generation in the tourism context. They tend to choose destinations and service providers that demonstrate a commitment to implementing environmentally friendly activities and social awareness for their surroundings.

### *3.6 Results and discussion*

The distributed questionnaire data was processed by millennial tourists who had visited the National Museum after its revitalization and used its smart tourism-based technology facilities. Based on the data obtained, a total of 65 respondents were collected for this study, with characteristics consistent with the millennial category.

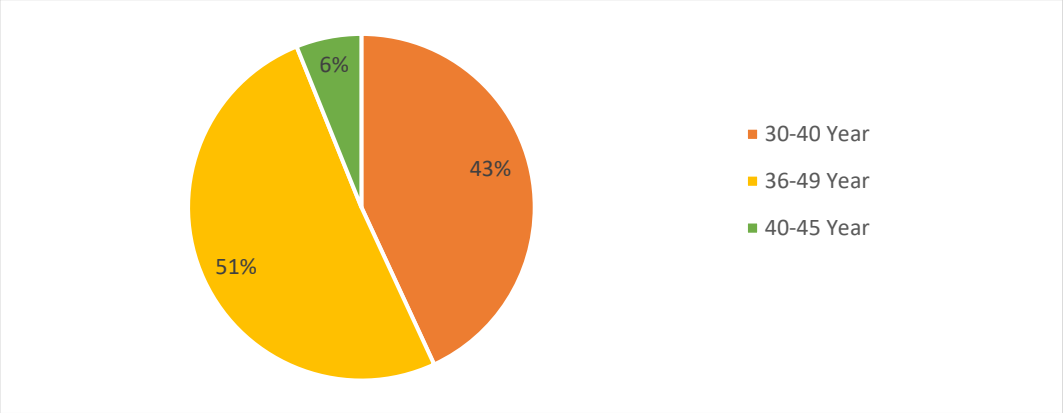



Fig. 3. Age chart of millennial travelers

Of the total number of respondents, 33 were male and the rest were female. Respondent participation was dominated by the 36-40 age group (50.8%), followed by the 30-35 age group (43.1%) and the 41-45 age group (6.1%). These findings indicate that younger millennial tourists are the dominant segment interested in visiting museums with an interactive digital approach. This is closely related to the characteristics of the millennial generation, which is open to new experiences and has a high interest in the use of technology in traveling (Sofronov, 2018).

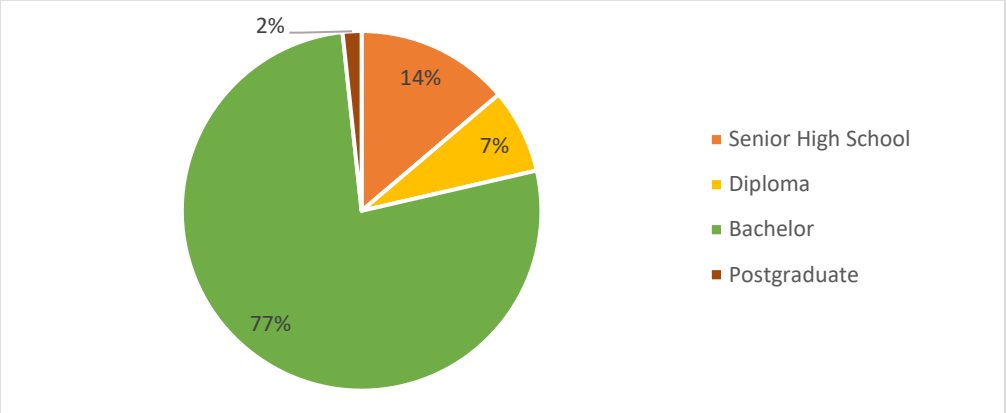



Fig. 4. Diagram of the educational status of millennial tourists

Meanwhile, based on educational level, individuals with a bachelor's degree (76.9%), followed by high school graduates (13.8%), diploma graduates (7.6%), and postgraduate graduates (1.7%). Furthermore, in terms of occupational background, the majority of respondents worked as private employees (67.7%), followed by civil servants (26.2%), and entrepreneurs (6.1%). This composition indicates that millennial tourists from various educational levels and occupational backgrounds are able to access and enjoy the technology available at the National Museum, indicating the inclusiveness of the implementation of smart tourism itself.

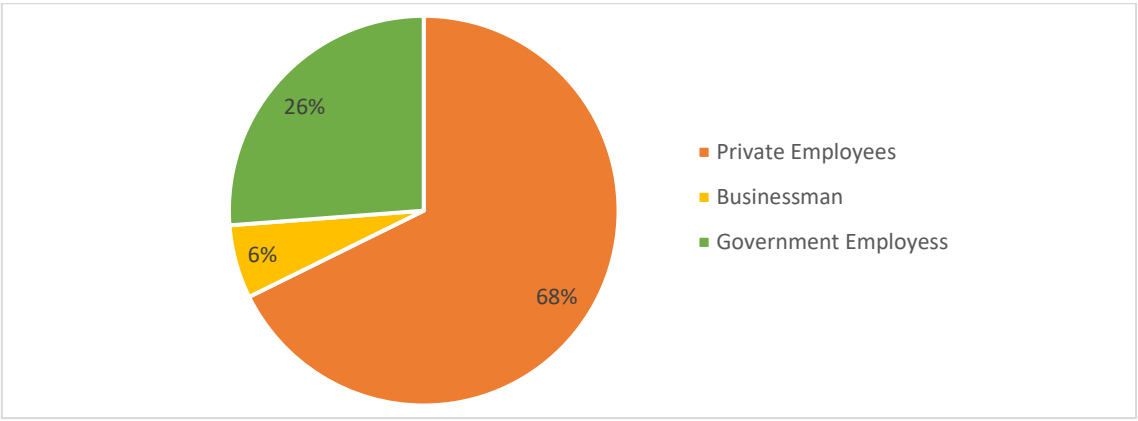



Fig. 5. Diagram of millennial travelers' occupational types

The measurement of external dimensions in this study includes five main indicators, namely color, uniqueness, stimulus intensity, movement, and novelty which are developed into 18 statements distributed through questionnaires as can be seen in table 1. Meanwhile, the measurement of internal dimensions includes five main indicators consisting of experience/knowledge, background, needs, motivation, and mood and is developed into 16 statements in table 3. Each statement is assessed using a Likert scale of 1-5 with the number 1 indicating a high level of disagreement and the number 5 high agreement.

Table 1. External dimension statements

| Indicator | Statement |
|---|---|
| Color | a. The interior colors of the National Museum are attractive. |
| | b. Color plays an important role in conveying a sense of technology within the National Museum. |
| | c. Color combinations contribute to the museum's smart concept. |
| | d. The right color selection can enhance the impression of technological advancement within the National Museum. |
| Uniqueness | a. The smart museum concept implemented by the National Museum is interesting. |
| | b. The collections at the National Museum are high-tech. |

| | |
|---|---|
| | c. The implementation of the smart museum concept is unique.<br>d the museum world. |
| Stimulus Intensity | a. Interaction with the National Museum's collection was of sufficient duration.<br>b. Interaction with the National Museum's collection met expectations.<br>c. The condition of the National Museum's collection was good.<br>d. The frequency of movement of the National Museum's miniatures or installations made the display attractive. |
| Movement | a. The moving collections at the National Museum are engaging.<br>b. The movement of the collections at the National Museum is as expected.<br>c. The augmented reality at the National Museum can be enjoyed with smooth movement. |
| Novelty | a. Being able to interact directly with the digital technology collection.<br>b. Gaining two-way interaction experience with the National Museum's digital technology collection.<br>c. The first visit to a museum that implements the smart museum concept is to the National Museum. |

The results of data processing on the external dimension are shown in table 2 where the average (mean) of five indicators is above four (very high) with color and uniqueness at the same number (4.21), stimulus intensity (4.18), novelty (4.10), and movement (4.00). This finding supports the external perception theory where external stimuli such as color, shape, and movement have a large influence in creating a positive assessment of a tourist attraction (Damartiasari, 2017).

Table 2. Descriptive statistics of external perspective

| No | Indicator | Number of Statements | Min | Max | Mean |
|---|---|---|---|---|---|
| 1. | Color | 4 | 1 | 5 | 4.21 |
| 2. | Uniqueness | 4 | 2 | 5 | 4.21 |
| 3. | Stimulus Intensity | 4 | 1 | 5 | 4.18 |
| 4. | Movement | 3 | 1 | 5 | 4.00 |
| 5. | Novelty | 3 | 1 | 5 | 4.10 |

The color and uniqueness indicators, which ranked at the top and had similar average scores, indicate that these two elements were most prominent in shaping tourists' positive impressions of the National Museum. This aligns with the characteristics of millennial tourists who place a high emphasis on visual aspects, especially for documentation and sharing content on social media (Hakim, 2019). Similarly, the concept of smart tourism, including the interactive technology "*Mengenal Paras Nusantara*," is seen as a novel approach not commonly found in other museums.

Similarly, scores on the stimulus intensity indicator indicate that the duration, sharpness of interaction, and the physical and technical conditions of the National Museum's collections are not merely informative but also immersive and enjoyable. Meanwhile, the novelty indicator is considered in line with the theory that two-way interactions create a fresh impression, meeting the expectations of millennials as experience seekers (Sofronov, 2018). In contrast to the movement indicator, the lowest score among the four indicators indicates that some features involving movement are not yet fully optimized. During the researchers' observations of museum visits, the majority of the collections were still touchscreen displays that remained stationary.

Table 3. Internal dimension statements

| Indicator | Statement |
|---|---|
| Experience | a. Visiting the National Museum, which implements the smart museum concept, is an unforgettable experience.<br>b. I gained more insight after visiting the National Museum.<br>c. The collections on display align with the information published on the National Museum's social media platforms. |

| | |
|---|---|
| Background | a. Visited the National Museum because they were interested in the smart museum concept.<br>b. Visited the National Museum because they were interested in its digital collections.<br>c. Visited because they were interested in the collections published on the National Museum's social media. |
| Needs | a. The digital technology collection at the National Museum aligns with smart museums.<br>b. Visiting the National Museum satisfied my curiosity about smart museums.<br>c. The information presented about the history of the National Museum and Indonesian history satisfied my curiosity. |
| Motivation | a. I want to experience direct interaction with digital technology at the National Museum.<br>b. The existence of digital technology makes me interested in visiting the National Museum.<br>c. I want to share moments from my visit to the National Museum on social media. |
| Mood | a. Visiting the National Museum makes me happy.<br>b. Interacting with the National Museum's collections makes me happy.<br>c. Direct interaction makes the experience at the National Museum more engaging.<br>d. Satisfied with the smart museum concept at the National Museum. |

Furthermore, according to the results of internal dimension data processing, it can be seen that the majority of indicators have an average value (mean) of more than 4 (very high) which is sorted from the highest value in mood (4.35), motivation (4.26), needs (4.18), and knowledge/experience (4.11). Meanwhile, only one indicator is below 4, namely background (3.98), which is still considered high. With a high average, it can be interpreted that factors originating from within individual respondents greatly influence the perception of the implementation of smart tourism at the National Museum.

Table 4. Descriptive statistics of internal perspective

| No | Indicator | Number of Statements | Min | Max | Mean |
|---|---|---|---|---|---|
| 1. | Knowledge/Experience | 3 | 1 | 5 | 4.11 |
| 2. | Background | 3 | 1 | 5 | 3.98 |
| 3. | Needs | 3 | 1 | 5 | 4.18 |
| 4. | Motivation | 3 | 1 | 5 | 4.26 |
| 5. | Mood | 4 | 2 | 5 | 4.35 |

The descriptive analysis, which found the mood indicator to be at the highest level compared to the other four indicators, indicates that a positive mood can increase tourists' openness to technology. This aligns with research showing that tourists' emotional experiences shape their perceptions of a tourist destination and their intention to recommend it to others (Prayag, 2017).

The motivation and needs indicator's subsequent ranking indicates that a strong curiosity for new experiences, along with tourists' need for convenience, comfort, and access to information, are crucial in encouraging the use of smart tourism, ultimately influencing tourists' perceptions. Furthermore, the knowledge/experience indicator also shows that tourists with prior knowledge or experience tend to have positive perceptions. Although the background indicator scored the lowest, it is possible that some respondents agreed that this indicator influenced their perceptions.

## 4. Conclusion

Based on the analysis, both external and internal dimensions provide a balanced positive contribution in shaping millennial tourists' perceptions of the implementation of smart tourism at the National Museum. The five external indicators (color, uniqueness,

stimulus intensity, movement, and novelty) show very high average scores (above 4), indicating that visual and innovative aspects such as attractive color choices, unique concepts, and new elements (e.g., AR/VR technology) predominantly attract visitors' attention. In particular, uniqueness and novelty elements were recorded as the highest indicators, emphasizing the importance of presenting original and innovative content. On the internal side, components such as knowledge/experience (mean 4.12), background (3.97), information needs (4.18), motivation (4.10), personality (4.16), and mood (4.25) also obtained high perception scores. This indicates that millennial tourists also actualize their personal experiences and motivations in responding to smart tourism features. In particular, the high score on the mood indicator (4.25) indicates that interactive and fun exhibition elements successfully create emotional engagement. Thus, positive tourist perceptions are formed from the synergy between external visual-technological stimuli and internal emotional-personal contexts. Overall, the National Museum has successfully created a positive perception of smart tourism among millennials. The combination of creative elements, such as aesthetic color schemes, interactive animations, and the latest technological innovations, along with attention to visitor motivation and experience, results in a dynamic and satisfying visit.

Based on the above findings, several strategic recommendations for the National Museum management are: Improvement of interactive visual movement features: Optimizing the quality of animations and AR/VR displays to make them smoother and more responsive, in line with the dynamic movement preferences of millennial tourists. For example, upgrading hardware/screens and ensuring smooth interactive interfaces can strengthen visitor appeal and engagement. Strengthening the emotional experience: Designing narrative and multisensory exhibition flows (combining audio, lighting, and textures) to enhance visitors' emotional engagement. This aligns with high scores on the mood indicator, allowing for a more immersive museum experience (e.g., personal stories, supporting background music) to further foster visitor satisfaction and enjoyment. Optimizing digital visual content: Updating visual content with high resolution and consistent aesthetic color design throughout the exhibition area, while providing attractive photo spots for social media. This recommendation is based on the finding that color and uniqueness play a crucial role. The use of new technologies (e.g., interactive projections, AR layers) and attractive color schemes can enhance aesthetic value, meeting the expectations of millennial tourists who actively share their experiences on digital platforms. Providing educational content tailored to a visitor needs: Developing a digital guide app or informative AR feature that interactively explains the historical context and uniqueness of the museum's collections. Given the relatively lower value of background indicators, adaptive information presentation (e.g., multilingual guides or interactive multimedia) can help visitors from various backgrounds appreciate the museum more deeply. Relevant and easily accessible information can also support millennial tourists' motivation to learn and explore. Implementing the above recommendations is expected to strengthen the smart tourism experience at the National Museum, aligned with the characteristics and expectations of millennial tourists. Uniqueness, technological innovation, and enhanced emotional satisfaction will keep the museum competitive and attractive as an educational and entertainment destination for the younger generation.

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Not available.

## Informed Consent Statement
Not available.

## Data Availability Statement
Not available.

## Conflicts of Interest
The authors declare no conflict of interest.



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