

A Foresight Study of Virtual Reality in Museums: Enhancing Visitor Engagement and Attendance

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Received 4 June 2025, Revised 11 July 2025, Accepted 28 July 2025

ABSTRACT

Museums, traditionally repositories of artifacts and culture, are facing challenges in attracting millennials and Gen-Z visitors. This study explores the potential of virtual reality (VR) technology to address these challenges. Specifically focusing on Malaysia, where VR adoption in museums remains largely unexplored, this research investigates the prospects and scenario building of VR adoption in these cultural institutions. Using STEEPV analysis, key drivers for VR adoption in museums are identified, with an emphasis on high-quality digital visualization and technology acknowledgment. The research includes questionnaire distribution and statistical analysis to pinpoint the primary drivers for intention to adopt VR technology in museums. Results indicate that improved visualization and technology acknowledgment are significant factors. These findings provide valuable insights for future reference and discussion on the role of VR in enhancing museum experiences and attracting younger audiences.

Keywords: Foresight Study, Technology Adoption, Museums, Visitor Engagement, Virtual Reality (VR).

1. INTRODUCTION

According to Kyriakou and Hermon [1], museums serve as institutions that “acquire, conserve, research, communicate, and exhibit” artifacts. While there are thousands of museums worldwide, only a few have begun implementing virtual reality (VR) technology. This new technology has garnered both positive and negative feedback from users. On the positive side, VR is seen as a compelling tool for history learning due to its immersive nature. However, there are concerns regarding authenticity, as Lee et al. [2] argue that “the presence of the original is the prerequisite to the concept of authenticity,” suggesting that original artifacts should be physically present in museums.

In Malaysia, virtual reality technology is not widely known to the public, often associated primarily with video gaming. VR applications typically require the use of goggles to immerse users in a virtual environment, creating a “virtual tourist” experience. As Skinner et al. [3] note, the use of gamification in museums is still in its early stages. Generation Z is likely to be drawn to virtual reality, as it provides a fresh perspective on museums. While museums traditionally exhibit artifacts, virtual reality allows everyone to view these artifacts without being physically present, aligning with the concept of gamification. Virtual reality has the potential to revolutionize educational practices and knowledge advancement. From an educational standpoint, VR can enhance students’ understanding of history, a subject often perceived as dull and factual. By making history more engaging, virtual reality can capture students’ interest. Furthermore, in terms of knowledge advancement, the public can become familiar with the

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application of virtual reality in museums, expanding their technological horizons beyond their usual experiences.

Millions of tourists visit Malaysia every year. However, the current museums in Malaysia are becoming monotonous and lack interactivity, which has led to minimal growth in the museum industry. As a solution, virtual reality (VR) is being suggested for implementation, as it is highly attractive to tourists and the public due to its ability to generate realistic images, sounds, and other sensations [2]. This recommendation is particularly relevant for Malaysia, known globally for its tourism and educational opportunities. VR can provide tourists with information and a virtual preview of destinations before they arrive [2], enhancing their understanding and appreciation of these destinations. Tourist behavior has shifted due to the Fourth Industrial Revolution (IR 4.0), where most devices are internet-enabled. Millennials, who make up a significant portion of the market, are demanding consumers who heavily influence market trends [4]. Defined as those born between 1980 and 2000, Millennials are now aged between 20 and 40 in 2020 and are known for their educational focus compared to previous generations [5]. According to Smith [6], Millennials are sociable, eco-friendly, and quick to adapt to new technologies [7]. These traits make Millennials more likely to visit museums that have implemented virtual reality technology. By adopting virtual reality, museums can offer Millennials a new and engaging experience. This technology fulfils both spiritual needs, such as a high-tech experience, and utilitarian needs, such as education. Millennials prefer various forms of communication, such as social media and electronic devices, which do not necessarily require face-to-face interaction. Thus, studying visitors' behavior in museums that have adopted virtual reality technology can provide valuable insights.

2. METHODOLOGY

According to Foresight International (2006) [8], foresight is the cognitive ability that enables individuals to anticipate, model, and respond to future possibilities. However, foresight is often an unconscious process, where individuals think about the future without realizing they are engaging in foresight. Methodology refers to the framework used to organize and interpret data, enhancing their significance. The study methodology adopted is STEEPV and a quantitative approach (Questionnaire Scenario). It occurs when the questionnaire is constructed, then distributed to the respondents. After that, the scoping will be in the STEEPV analysis. STEEPV is a tool that started with brainstorming ideas. It is also known as STEEP, which was invented by Francis Aguilar (1967) [9]. This can help the researcher study more of the various aspects rather than just focusing on a single driver. Table 1 shows the categories of the STEEPV in the research study.

Table 1: Categories of the STEEPV in the research study.

Categories	Area Covered
Social	Lifestyle (for example the use of leisure time, patterns of family living), demographic systems, social inclusion, and cohesion problems (lifestyle fragmentation and (in)equality rates, trends in education).
Technological	Technical advance rates, the speed of dissemination of technologies, technological problems and threats (including protection and health concerns).
Environmental	Sustainability and climate change challenges, more regional environmental problems, including deforestation, loss of resources and associated habitats, as well as welfare concerns.
Economic	Economic growth levels and distribution, industrial structures, competitiveness, markets, and financial problems.
Political	Enforcing political points of view, (in)stability, governance's regulatory positions and acts, political intervention, and non-state lobbying (for example, organizations, paramilitaries).
Values	Working behaviors (entrepreneurship, career ambitions, authority inequality, demands for mobility (e.g., through occupations or places), interests in recreation, community, and social connections.

3. RESULTS AND DISCUSSION

The primary focus of this study is on museums, which have traditionally been fixed structures that convey histories through artifacts to visitors indirectly. The introduction of virtual reality technology in museums may spark discussions among museum professionals regarding its potential impact on authenticity. However, the integration of augmented reality has the potential not only to enhance visitor engagement but also to increase attendance rates. Furthermore, AR applications in museums present opportunities for creative storytelling and immersive experiences by superimposing virtual elements onto real-world environments. This technology could potentially revolutionize how visitors engage with exhibits, offering enriched and interactive experiences while bringing historical artifacts to life and facilitating enhanced learning opportunities through additional content.

3.1 Virtual Reality

Puig et al. [10] stated that virtual reality has significantly contributed to visitors' better understanding of new technology applications in museums. The increasing adoption of virtual reality is particularly notable in the current era of advanced technology, benefiting individuals across various domains, including finance, entertainment, healthcare, and education, by providing them with novel experiences. For instance, in the field of education, some international schools have integrated e-learning platforms where students and teachers can engage in virtual classrooms without physical interaction. Research on Education and Human Computer Interaction suggests that learning through virtual reality is both more efficient and engaging [11].

3.2 Virtual Reality in the Museum

Museums, traditionally considered as stationary structures showcasing historical artifacts, are renowned for presenting authentic relics [12]. However, contemporary generations such as Gen-Y and Gen-Z show less interest in conventional exhibits. Instead, they display a greater inclination towards electronic devices. Consequently, the focus of new technology is on capturing the attention of millennials and Gen-Z, the key consumer segments, due to their significant market consumption patterns determined by their age groups.

3.3 STEEPV Analysis

Virtual reality has the potential to influence museum visitors' perspectives from a social standpoint. In terms of technology, Patterson and Han [13] have highlighted the use of virtual reality in the field of education. From an economic perspective, Mallia et al. [14] discussed how cost-effective immersive technologies can enhance cultural offerings. Katz and Halpern's [11] research indicates that institutions could reduce utility expenses through virtual classes. The implementation of virtual reality in museums may require government investment in infrastructure under MEXT sponsorship from a political viewpoint. Additionally, concerns about preserving traditional museum authenticity have been raised within the values aspect by Lee et al. [2]. The integration of virtual reality technology in museums has the potential to revolutionize the visitor experience and engage younger generations who are more drawn to digital devices. In summary, the frequency of the STEEPV analysis is shown in Table 2.

Table 2: The frequency of the STEEPV analysis.

Factors	Total
Social	12
Technological	42
Economic	5
Environmental	3
Political	7
Values	3

3.4 Merged Issues and Drivers

This research has identified major issues and drivers for the future trend of virtual reality adoption in museums. The issues and drivers were then merged as in Table 3.

Table 3: The issues and drivers.

No.	Key Issues	Key Drivers
D1.	Introduce the VR technology to the public can enhance the importance of new technology.	Technology acknowledgement
D2.	The evolution of technologies such as virtual reality technology can be accepted by the community.	Community acceptance
D3.	The adoption of virtual human technology in museums can save the cost of labor of museums.	Reduced labor cost
D4.	The use of virtual reality technology in museums can encourage positive thinking especially during interactive sessions about artifacts.	Educational attractiveness
D5.	The real environment can be experienced with virtual reality technology.	Virtual reality environment
D6.	Virtual reality technology such as a 3D mapping system will improve the tour guiding with guider to a self-tour guiding for those who hate distraction from surroundings.	Application of 3D mapping technology
D7.	The application of virtual reality technology in museums will change the communication process from face-to-face interaction to online devices such as smartphones.	Advanced communication process
D8.	The adoption of virtual reality technology in museums can reduce the level of authenticity of museums.	Reduced authenticity
D9.	Installation of virtual reality technology can maximize the opportunities for edutainment (education and entertainment) among visitors in museums.	Advanced educational tool
D10.	Adoption an advanced technology such as virtual reality with high-definition visualization will enhance the attractiveness of museums among the younger generation.	High-definition visualization attracts younger generation intention
D11.	Virtual reality technology provides a better educational process, maintenance, and attractiveness for both museums and visitors.	Infrastructure investment elevates interactive capability

4. CONCLUSION

Based on STEEPV analysis, the technology factor is the most important driver for virtual reality technology adoption in museums, followed by social, political, economic, environmental, and values. The use of new methods in virtual reality, such as combining traditional and modern promotion techniques, makes it more attractive. According to Grincheva [15], she said that museums employ and choose digital platforms that would be able to attract visitors and change the perception that museums are outdated. The use of the internet for promotional purposes is only just beginning, and today it seems to have a more significant role to play. Due to further technological advancements, museums will likely become more prominent in the future, promoting “Visit Melaka” for tourism purposes and enhancing the appeal of museums. The development of information technology and social networks presents a new opportunity for museums to implement innovative strategies. Besides, the low quality of digital visualization is the key to success for this technology. This is because the visual quality is a very important element that must be provided, especially involving shows or events conducted by the museums. A low level of visualization quality will make visitors easily bored and not interested in the museum. Next, the quality of visualization incurred high costs from its manufacturing process until the installation process. According to Carrozzino and Bergamasco [16], the Museum of Pure Form, with its complete immersive installation, provides the best experience for users, but at a high cost. In his scenario, there is high virtual reality acknowledgement, but it has a problem, which is the low quality of digital visualization. The virtual reality technology adoption in museums can be commercialized after the development stage. However, when the researcher is not willing to focus on the visual quality element, it will cause problems and be threatened by the other museums that installed it. Hence, the government must upgrade the visual quality in museums so that problems such as museums being outdated can be prevented.

ACKNOWLEDGEMENT

We extend our heartfelt thanks to Universiti Tun Hussein Onn Malaysia and the Faculty of Technology Management and Business for providing the environment and resources that made this research possible. We are also grateful for the support of the entire faculty and staff.

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Conflict of interest statement: The authors declare no conflict of interest.

Author contributions statement: Conceptualization, Nurfawwazim Norazmi & Alina Shamsuddin; Methodology, Alina Shamsuddin & Wan Nurul Karimah Wan Ahmad; Formal Analysis, Wan Nurul Karimah Wan Ahmad & Eta Wahab; Investigation, Nurfawwazim Norazmi; Writing & Editing, Alina Shamsuddin.