

Evaluating the role of video within multi-sensory cultural experiences

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Abstract—This short paper reports a recent experiment with digital content and its evaluation in terms of impact in multi-sensory visiting experience, by recording visitors' opinion during its use within a cultural exhibition. Specifically, the aim of this experiment was to understand if and how QR code-enabled video can enhance the multi-sensory visiting experience within a cultural exhibition. This research aims to answer the following three research questions: a) Is QR code-enabled video supportive in the multi-sensory visiting experience of cultural exhibitions? b) How can QR code-enabled video keep the audience's interest in terms of the exhibition's content/subject? c) Can a QR code-enabled video activate visitors' emotions and enrich their sensory experience? To achieve this goal, five videos and a quiz were developed and afterwards evaluated by a traditional hard-copy questionnaire. The findings of this experiment are briefly presented in this paper.

Keywords—Video, exhibition, visiting experience

I. INTRODUCTION

The integration of technology and digital content in museums has significantly reshaped visitors' experiences, transforming these institutions from static exhibition spaces into dynamic, interactive cultural hubs [1]. According to the researchers, the museum visit is now seen as a holistic process that engages all senses, emotions, and cognition, blending education with entertainment [2]. Research suggests that technological applications in museums impact visitor experience across three key dimensions: functionality, aesthetics, and emotional response [3]. These factors collectively shape how visitors perceive and interact with museum content, affecting their overall satisfaction and engagement levels.

As visitors interact with apps and digital content, frequently through QR codes and other technological tools, they adopt multiple roles, including that of explorer, historian, and community participant, enriching both their cultural and personal experiences [4]. As museums increasingly seek innovative ways to integrate technology into their exhibitions, digital content (e.g., QR-code enabled one) remains a vital component in enhancing the overall visitor experience [5], [2], [6].

Despite the growing integration of QR code-enabled digital content in museum exhibitions, several challenges and open issues remain. One major limitation is the lack of direct evidence proving that QR code-enabled digital content trigger emotional engagement in visitors [3], [6]. While increased interaction and prolonged presence in the exhibition space may indirectly contribute to a more immersive and

emotionally enriched experience, empirical studies specifically measuring these emotional responses are scarce [7], [8].

Additionally, technological barriers and user accessibility remain key concerns of visiting experiences in cultural spaces. For instance, visitors that are not familiar with QR code technology, or visitors lacking a smartphone, find it difficult to interact with exhibits that have been designed to inform them through QR code-enabled content. Ensuring that museums provide clear instructions and alternative methods for accessing digital content related to their exhibits is crucial to inclusiveness [9].

Finally, while QR code-enabled content offers an affordable and flexible way to share digital content among visitors that are also smartphone owners/users, their success largely depends on the quality and relevance of the provided content [8], [10]. Poorly designed or outdated content can lead to a disappointing visiting experience, potentially reducing visitor engagement rather than enhancing it [11]. Museums must continuously update and refine their digital offerings to ensure a seamless and valuable interaction for their audiences.

This paper presents the results of a recent experiment conducted with the aim of exploring how QR-enabled digital content (in particular, video) influences the multi-sensory visiting experience in cultural exhibitions, i.e., how QR technology can be leveraged to seamlessly enable digital content, and thus create more immersive, educational, and memorable multi-sensory experiences.

It was motivated by the fact that while QR codes are widely used in museums, there is still a lack of empirical evidence on their effectiveness in enhancing visitor engagement, sustaining interest, and evoking emotions. This study aims to fill this gap by analyzing whether QR code-enabled digital content i.e., video, can create a more immersive, interactive, and meaningful experience for museum visitors.

Through this research, authors seek to answer the following key questions:

- Do digital content (video) enhance the overall multi-sensory visiting experience in cultural exhibitions?
- How does digital content (video) influence visitors' engagement to the exhibition's content?
- Can digital content (video) triggers emotional responses and contribute to a richer sensory experience?

To address these questions, the experiment provides insights into the role of QR code-enabled video in modern multi-sensory museum experiences, offering valuable knowledge for exhibition designers, educators, and museum professionals looking to integrate digital tools effectively.

The structure of the paper is as follows: Section II presents related work, Section III presents the experimental setup, and Section IV the related results. Section V concludes the paper.

II. RELATED WORK

Existing studies highlight the potential benefits of QR code-enabled content in enhancing visitor engagement, providing additional content, and integrating digital interaction within exhibitions. However, they also present certain limitations that justify the need for further experimentation.

Lack of Direct Evidence on Emotional Engagement: Several studies [7], [12], [13] have demonstrated that QR codes enhance visitor engagement, interaction, and learning. However, there is no conclusive evidence that QR codes evoke emotional responses. While prolonged engagement may suggest immersion, no study has directly measured emotional impact.

Limited Comparative Analysis with Other Technologies: Related research [8] compared QR codes to screens and tablets but lacked depth in assessing engagement differences. There is a need for comprehensive comparative studies to evaluate the effectiveness of QR codes versus more expensive alternatives like interactive touchscreens. Several studies [7], [14] assume visitors are familiar with QR codes, but not all are comfortable with smartphone-based interactions. Accessibility concern exists for those who do not own smartphones or prefer traditional museum guides [7].

Over-Reliance on Information Delivery Rather than Storytelling: QR codes in museum exhibitions often focus on enabling factual content (e.g., historical details, 3D models, audiovisual materials). The Qrator program (Grand Museum of Zoology) [10] and "The Speaking Celt" app [13] highlight the importance of storytelling in visitor engagement. A lack of engaging narratives can limit the impact of QR-based experiences.

Integration Challenges with Museum Spaces: A few projects, such as "The Speaking Celt," have struggled with seamless integration, where the digital experience overshadowed physical artifacts rather than complementing them [13]. Effective QR-based applications should balance digital enhancement with physical exhibit engagement [2].

Going beyond the related works, the study presented in this paper aims to explore whether QR code-enabled digital content, especially video, influence visitors' emotions and enhances the overall visiting experience in cultural exhibitions, addressing the absence of direct evidence in prior research. The actual evaluation of the type of media (QR code vs others) that enables the digital content (video) is not an objective of this research line, thus not included or discussed further.

III. EXPERIMENTAL SETUP

As part of the fourth-year undergraduate course "Exhibition Design II", students from the Department of Cultural Technology and Communication at the University of

the Aegean were tasked with designing and implementing five QR code-enabled videos and a quiz with the aim to support visitors of the cultural exhibition "Seagulls Are Coming: The Museologists Meet Kioste", an event organized by postgraduate students specializing in Museology in collaboration with the Kioste Association, an Asia Minor cultural organization in Mytilene. The exhibition explored the history of the Kioste community, focusing on the refugee settlement in Mytilene, the social integration of its members, and their journey across generations. The students created the content by incorporating oral testimonies, archival materials, and relics brought by the community's ancestors. This resulted in a multimedia-rich exhibition featuring text, video, sound, and immersive visual elements. Following an in-depth study of the exhibition theme, students identified two central pillars: a) The Life Cycle of a Trawl (Fishing Boat) – From its construction to its decline, and b) The Nostalgic Memory of Kioste – Capturing the emotional ties to the ancestral village. From these pillars, six thematic subcategories were selected, each represented by a specific object within the exhibition, linked to a QR code. By scanning the codes, visitors accessed short videos (15–30 seconds) combining animated images, archival photographs, and audio excerpts from Giannis Aikaterinis' book, *Lost Homelands: Our Village*. Agia Paraskevi of Cesme (Kioeste). The five QR code-enabled videos, and the QR code-enabled quiz, are listed below:

1. *"Life on the Trawl" – The experiences of a fisherman living at sea for six months. Object: A fisherman's meal plate.*
2. *"Kioeste Today" – An overview of the contemporary village. Object: A paper cube featuring images of Kioste.*
3. *"The Sfanto" – The legend of the village's ghostly presence. Object: A 3D-printed representation of the "Sfanto."*
4. *"The Spinning Top" – A childhood toy rediscovered. Object: An old wooden spinning top.*
5. *"The Kioste Association" – A tribute to the organization's cultural role. Object: The association's flag.*
6. *"The Quiz" – An interactive questionnaire designed to encourage visitor participation. Object: A café-style iron table.*

"The Quiz" featured a five-question interactive quiz, encouraging visitors to reflect on their personal experiences and emotions related to the exhibition. The quiz covered topics such as:

- Personal endurance in challenging conditions (e.g., life on a fishing boat).
- The significance of cultural heritage and nostalgia.
- Emotional responses to storytelling elements in the exhibition.

This approach not only enriched the visitor experience but also allowed for data collection, providing valuable insights into future museum design improvements. The QR code-enabled video and quiz were evaluated by using a printed-out evaluation questionnaire.

The following four (4) stages of evaluation were followed: A) The first stage was the design and implementation of the QR code-enabled videos that included custom-made videos and excerpts from the book of, Giannis Aikaterinis, and the creation of a QR code-enabled interactive quizzes with 5 questions that were used to evaluate the 5 videos. B) The

second stage of the evaluation was the design of the hard-copy questionnaire that was used to evaluate the overall experience of visitors with the QR code-enabled videos and the quiz. C) The third stage was to distribute the hard-copy questionnaire to the visitors of the exhibition who had already used the QR code-enabled content via their mobile phones. D) The fourth stage was to collect and analyze the data (visitors' answers).

For the purposes of the conducted research, a hard-copy questionnaire¹ was chosen as the research analysis tool. Initially, the questionnaire was distributed in a printed-out form to exhibition visitors who used the QR code-enabled content. However, to facilitate the processing and further analysis of the results, the responses were later recorded in an electronic file (Google form).

The questionnaire was anonymous and consisted of clear, short and predetermined answers, closed multiple choice type, where the visitor could choose one or more answers. Four questions were open-ended, and visitors had the opportunity to select "Other". The research data was collected through nine multiple-choice questions². The concise design was intentionally chosen to encourage participant engagement. On the first page of the questionnaire, a brief informational note was provided, including the researcher's details, the subject of the study, the organization conducting the research, and its purpose. The survey was conducted from 1st to 6th June 2024, resulting in 57 complete questionnaires (57 unique visitors/participants). The analysis of the results is presented in the following section.

IV. RESULTS

Regarding the demographic data, most participants were male, accounting for the 61.4% of the visitors. The predominant age groups were between 35-54 and 18-24 years old. Most of the participants were employees (56.1%), followed by students (17.5%). The educational level of the sample was high, with more than half of the visitors holding a university degree, and the rest being high school graduates. Additionally, 94.7% were users of smartphones.

Based on participants' answers, the provided/evaluated QR code-enabled content managed to evoke a sense of nostalgia in 75.4% of their users. 28.1% of them felt entertained by the videos, 10.5% felt confused, while 1.8% experienced emotions such as nostalgia, and satisfaction. 1.8% did not feel any strong emotions. 57.9% of visitors found the content original and appealing, and the 38.6% stated that their interest remained undiminished. Moreover, 3.5% of the visitors/users found the content indifferent and overloaded with information. 68.4% found the videos interesting, while 43.9% found them supportive. 22.8% described the content of the videos originally, while 1.8% considered it ordinary.

The following paragraphs present the analysis of the results in accordance with the three research questions of this experiment, as stated in the Introduction.

A. QR code-enabled video enhance the visiting experience within a museum exhibition

The findings indicated that the QR code-enabled videos have enriched the visiting experience of participants in this experiment by providing interactive and engaging multimedia

content (videos, audio excerpts, 3D models, etc.), enhancing the overall sensory experience beyond traditional static displays.

Most of the participants found the content to be original and appealing, which helped them to maintain their interest throughout their visit to the exhibition.

The integration of digital elements contributed to a more dynamic and interactive museum environment, demonstrating that QR technology is an effective tool for exhibition enhancement.

A significant percentage of participants found the videos to be interesting and supportive, reinforcing the idea that QR codes add value to the museum experience.

B. QR code-enabled video deepen visitors' connection to the exhibition's content

Participants have reported the experience of the feeling of nostalgia, suggesting an emotional connection to the exhibition's themes.

The integration of archival photos, audio recordings, and personal narratives helped visitors to engage on a deeper level of visiting experience, as they could relate themselves to the stories presented in the videos.

Storytelling using QR code-enabled video facilitated a more immersive and reflective experience, strengthening visitors' connection to the historical and cultural aspects of the exhibition.

C. QR code-enabled video provide new perspectives on the exhibition's visiting experience

This study concludes that QR-enabled digital content is possible to expand the way visitors interacted with the exhibition, introducing audiovisual storytelling and interactive elements that traditional museum displays often lack.

The interactive quiz not only entertained visitors, but also prompted self-reflection, encouraging them to think about their own experiences and perspectives in relation to the exhibition's themes.

The successful utilization of QR code-enabled video suggests that such type of digital content can reshape museum engagement strategies, paving the way for further innovations in exhibition design.

D. Research Conclusions

In summary, the analysis of the experimental results confirmed that the QR code-enabled video effectively supported and enhanced the exhibition's visiting experience. Visitors found the multimedia content both engaging and emotionally impactful. The combination of nostalgia feeling, entertainment, and interactivity proves that QR code-enabled video can be valuable instrument for modern museum visiting experiences. These findings not only validate the positive role of QR-enabled digital content in cultural exhibitions but also suggest the need to investigate further opportunities for integrating technology-enabled digital content into cultural exhibitions practice.

¹ <https://drive.google.com/file/d/169L3CGsDh35DWaX3Gh7-TH6Pi4SwbRaY/view?usp=sharing>

² https://drive.google.com/file/d/1k8puv9xSLeHXDtHMLIsNYInrvneKA_66/view?usp=sharing

While the study does not directly address the senses of touch, smell or taste, it suggests that video can be used to engage the mind and emotions, influencing sensory perception. The storytelling aspect immerses visitors mentally, which can create a more multi-sensory experience in the imagination (e.g., hearing a story about life in a trawl and mentally picturing the sea, the smell of fish, or the feel of boat wood).

V. CONCLUSION

This study has presented preliminary results of recent experiments on the use of QR code-enabled video in cultural exhibitions. Those experiments supported authors' research hypothesis that, when designed properly, technology-enabled digital content can transform the visiting experience into cultural spaces. The findings presented confirm that QR code-enabled video can be used to enhance visitor engagement, evoke emotions, and provide new perspectives on visiting experiences in cultural spaces. By focusing on user experience, meaningful content, and interactive participation, museums can leverage QR technology to seamlessly enable digital content, and thus create more immersive, educational, and memorable multi-sensory experiences.

While challenges such as usability and accessibility remain, the key is to prioritize exhibit content over technology itself. Future QR code-enabled content may incorporate branching narratives, gamification, and AI-driven personalization, offering visitors a greater sense of agency in shaping their journey in museums and other cultural spaces. As museums continue to embrace digital innovation, QR codes could play a crucial role in fostering dynamic, inclusive, and sustainable engagement with cultural heritage.

QR code-enabled video contribute to a richer multi-sensory experience through vision and sound. In the experiment conducted, QR code-enabled content has enhanced the visiting experience of the exhibition through visual and auditory storytelling, enabling visitors to feel (and be) connected to historical and cultural stories. However, current research does not explore the senses of touch, smell or taste, thus, a truly multi-sensory experience is still not evaluated. Future experiments that integrate haptic feedback, smell and taste-enhanced XR equipment, facilitated by the 6G network and the Internet of Senses (IoS), could make visiting experience in cultural exhibitions even more immersive.

Still, a key issue remains whether QR code-enabled content enhances immersion or distracts the visitor from the physical exhibition environment. Although this article does not provide a definitive answer, it highlights the need for further research on balancing physical and digital experiences in museum exhibitions.

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REFERENCES

- [1] **[BNHL17]** BEN NASR, I., HALLEM, Y., and LAGIER, J. "Quel est le rôle de l'application mobile dans la valorisation de l'expérience muséale?". *Management & Avenir*, vol. 2, no. 2, 2017, pp. 87–108. [Online]. Available: <https://doi.org/10.3917/mav.092.0087>.
- [2] **[Cha24]** CHARR, M. "QR Codes in Museums: Unlocking New Opportunities in 2025". *MuseumNext*, 2024. [Online]. Available: <https://www.museumnext.com/article/qr-codes-are-experiencing-a-resurgence-but-how-can-they-benefit-museums/>.
- [3] **[HC19]** HORNECKER, E. and CIOLFI, L. "Human-Computer Interactions in Museums". *Synthesis Lectures on Human-Centered Informatics*, 2019. [Online]. Available: <https://www.morganclaypool.com/doi/abs/10.2200/S00901ED1V01Y201902HCI042>.
- [4] **[Duk10]** DUKE, L. "The Museum Visit: It's an Experience, Not a Lesson". *Curator: The Museum Journal*, vol. 53, 2010, pp. 271–279. [Online]. Available: <https://doi.org/10.1111/j.2151-6952.2010.00028.x>.
- [5] **[ONL24]** *Case Study: Using QR Codes for Interactive Museum Experiences*, 2024. [Online]. Available: <https://onlqr.com/resource/case-study-using-qr-codes-for-interactive-museum-experiences/>.
- [6] **[TM07]** THÜRING, M. and MAHLKE, S. "Usability, aesthetics and emotions in human–technology interaction". *International Journal of Psychology*, vol. 42, no. 4, 2007, pp. 253–264.
- [7] **[CMP*09]** CEIPIDOR, U. B., MEDGLIA, C. M., PERRONE, M., DE MARSICO, M., and DI ROMANO, F. "A Museum Mobile Game for Children Using QR-Codes". In *Proceedings of the 8th International Conference on Interaction Design and Children*, 2009, pp. 282–283.
- [8] **[NMS22]** NATIONAL MUSEUMS SCOTLAND. "QR codes in museums: worth the effort?". *The Galloway Hoard Exhibition*, July 19, 2022. [Online]. Available: <https://blog.nms.ac.uk/2022/07/19/qr-codes-in-museums-worth-the-effort/>.
- [9] **[PER16]** PEREZ-SANAGUSTIN, M., et al. "Using QR codes to increase user engagement in museum-like spaces". *Computers in Human Behavior*, vol. 60, 2016, pp. 73–85.
- [10] **[Cur24]** CURRIER MUSEUM OF ART. "Enhancing visitor engagement through digital innovation". *Currier Museum of Art*, 2024.
- [11] **[PGG13]** PALUMBO, F., GIUSTI, G. B., and GANDOLFO, D. "Designing a mobile app for museums according to the drivers of visitor satisfaction". In *Proc. 1st Int. Conf. on Management, Marketing, Tourism, Retail, Finance and Computer Applications (MATREFC '13)*, 2013.
- [12] **[CMD23]** CHASAPIS, P., MITROPOULOS, S., and DOULIGERIS, C. "A prototype mobile application for the Athens Numismatic Museum". *Applied Computing and Informatics*, vol. 19, no. 1/2, 2023, pp. 144–172. [Online]. Available: <https://doi.org/10.1016/j.aci.2019.06.001>.
- [13] **[Wik]** *The Speaking Celt Museum Experience - Wikitude Showcase*. [Online]. Available: <https://www.wikitude.com/showcase/speaking-celt-museum-experience/>.
- [14] **[Dam13]** DAMALA, A., et al. "Exploring the Effective Museum Visiting Experience: Adaptive Augmented Reality (A2R) and Cultural Heritage". *International Journal of Heritage in the Digital Era*, vol. 2, no. 1, 2013, pp. 116–141.