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RESEARCH ARTICLE



The effect of engagement on revisit intentions across visitation formats: insights from the World Heritage Site of Pompeii

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ABSTRACT

While insight into visitor engagement proliferates, understanding the effect of engagement on visitors' intention to revisit cultural heritage sites across physical, technology-enhanced, and virtual formats remains limited, leaving a significant gap in the literature. Addressing this gap, this research investigates how visitors' cognitive, emotional, and behavioural engagement affect their traditional physical (RI), technology-enhanced on-site (T-RI), and purely virtual (V-RI) revisit intentions. In collaboration with the Archaeological Park of Pompeii (Italy), we surveyed international visitors and obtained 572 valid responses. Structural equation modelling (SEM) results reveal that emotional engagement consistently predicts all three revisit intentions, cognitive engagement significantly influences physical revisit intention, and behavioural engagement primarily drives virtual revisit intention. This research advances theoretical insight into the differential predictive role of engagement dimensions across distinct forms of revisit intention, while informing cultural heritage sites evaluating or expanding visitation formats.

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Visitor engagement; revisit intention; UNESCO world heritage site; phygital visit; technology-enhanced visit; virtual visit

1. Introduction

Owing to technological advances, the nature of visitors' connections with cultural heritage sites is changing (Seyitoğlu et al., 2024). For example, while traditional site visits occurred exclusively in physical settings, interactive technological interfaces and platforms are increasingly allowing individuals to visit destination or attraction sites in purely virtual (remote) and technology-enhanced (hybrid) formats (Itani & Hollebeek, 2021). This shift has become increasingly evident since the pandemic, with many attraction sites offering remote or hybrid access options to secure visiting continuity. Relatedly, remote or hybrid visit options have been heralded for their emission reducing capabilities (e.g. by reducing greenhouse gas/travel-related emissions; UN, 2024; WEF, 2023).

Attraction sites, including cultural heritage sites, are therefore increasingly offering digital, immersive virtual technologies (Griffin et al., 2023; Seyitoğlu et al., 2024). Specifically, such technologies offer viable alternatives to sustain visitor engagement and reduce the organisation's susceptibility

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(e.g. a mandated temporary closure) in the event of crises (Buhalis et al., 2023; Kılıçarslan et al., 2024), while simultaneously offering new (e.g. business model) opportunities (Botti & Baldi, 2025).

Specifically, over a third of museums worldwide have adopted or plan to adopt immersive tools like Augmented Reality (AR), Virtual Reality (VR), Mixed Reality (MR), the Metaverse, and/or fully virtual online tours, among others (Museum Booster, 2025). By permitting visitors' remote pre-site visit exploration or by enhancing their on-site visit experience, these technologies may complement or replace traditional on-site visits (Huang et al., 2025; Yung et al., 2021). In doing so, they extend both the depth and the duration of visitors' engagement with heritage sites (Carrasco-García et al., 2025; Itani & Hollebeek, 2021; Rather et al., 2025).

In this evolving environment, *visitor engagement*, visitors' investment of cognitive, emotional, and behavioural resources in their interactions with a heritage site (Hollebeek et al., 2019a; Rasoolimanesh et al., 2021), plays a critical role. Prior research has shown that memorable experiences are likely to stimulate meaningful engagement, in turn fostering deeper connections and stronger revisit intentions (Flavián et al., 2021; Omran et al., 2024). These dynamics have been explored across a range of tourism contexts, including hotels (Shafiee et al., 2020) to cultural and heritage attractions (Bryce et al., 2015), among others, with a growing focus on the role of digital and immersive technologies in shaping visitor perceptions and behaviours (Jiang et al., 2023b; Yung et al., 2021).

In this context, growing scholarly attention has been devoted to how virtual tours and technology-enhanced experiences may stimulate visitors' pre-site visit engagement (Ahmad et al., 2023; Carrasco-García et al., 2025; Rather et al., 2025), enrich the on-site experience (Baran & Karaca, 2024; Flavián et al., 2021; Huang et al., 2025), and/or subsequently foster visitors' intention to physically revisit the destination (Geng et al., 2024; Manchanda & Deb, 2022; Suhartanto et al., 2021).

However, despite extant insight (e.g. Carrasco-García et al., 2025), as well as growing recognition of the symbiotic interplay between physical and virtual modalities (Mele et al., 2025), empirical understanding of the effect of visitor engagement, as it emerges from traditional physical site visits, fully remote visits, and hybrid (phygital) visits, as well as the role of initial physical site visits, followed by individuals' willingness to subsequently engage in either technology-enhanced or fully remote visits, remains limited (Baran & Karaca, 2024; Kılıçarslan et al., 2024), exposing an important gap in the literature. That is, a need exists to undertake a comparative assessment of visitors' intention to revisit different site formats, which differ in terms of their respective levels of technology adoption (Liu & Park, 2024).

Addressing this gap, we investigate how visitors' cognitive, emotional, and behavioural engagement with a cultural heritage site influences revisit intentions across three different formats: (a) *physically* (i.e. traditional site visit), (b) through an on-site *technology-enhanced* experience, or (c) through a purely *virtual* (remote) format. Exploration of these issues from a visitor engagement perspective is of particular importance, given the core link between visitor engagement and new technology, which aims to prolong or extend users' engagement through different touchpoints (Hollebeek et al., 2019).

Building on prior engagement research that conceptualises engagement as a multidimensional construct influencing visitors' loyalty intentions (Rasoolimanesh et al., 2021; Rasul et al., 2024), we adopt the widely used attitude formation model (Fishbein, 1967; Seyfi et al., 2024), which has been previously linked to engagement (Bryce et al., 2015; Harrigan et al., 2017) and behavioural intention (Han et al., 2011) alike, warranting its applicability in our research context. This research is guided by the following overall research question:

How does visitors' cognitive, emotional, and behavioural engagement with a cultural heritage site influence their revisit intentions across physical, technology-enhanced, or fully virtual formats?

Consistent with prior studies adopting a single cultural heritage context (e.g. Huang et al., 2025; Rather et al., 2025), a questionnaire was administered to international visitors at the Pompeii Archaeological Park (Italy), one of the most visited UNESCO World Heritage Sites in Europe, with over four

million visitors in 2024 (Pompeii, 2024). Globally renowned for its scale, historical significance, and dynamic visitor offering, Pompeii continues to evolve through ongoing excavations, creating a living narrative that sustains public interest and fosters recurring engagement (MiC, 2021; Pompeii, 2025).

This study offers both theoretical and practical contributions within the cultural heritage context. Theoretically, it advances the visitor engagement literature by showing how its dimensions can foster sustained connections through emerging technologies, extending prior work that has largely considered immersive tools as antecedents of engagement (Flavián et al., 2021; Yung et al., 2021). It further conceptualises revisit intention as a multi-format, technology-dependent outcome, thereby broadening the scope of loyalty research and aligning with perspectives on digitally extended ties and the phygital continuum (Deng et al., 2025; Mele et al., 2025). In this vein, it introduces technology-enhanced revisit intention (T-RI) and virtual revisit intention (V-RI) as potentially novel constructs, addressing recent calls to reconceptualise post-experience behaviour in cultural heritage contexts (Trunfio et al., 2022).

Practically, the collaboration with the Park provides managers with evidence-based insights to guide immediate decisions and track their effects over time, particularly regarding the implementation of new technologies and phygital visit models. The results also inform similar institutions on how to create emotional engagement to strengthen a lifelong connection across formats (e.g. through symbolic narratives), stimulate cognitive engagement to encourage physical revisits (e.g. via layered interpretive tools), and foster behavioural engagement to sustain virtual return (e.g. through participatory communities). Collectively, these insights support the design of resilient strategies that integrate physical, digital, and phygital touchpoints (Buhalis et al., 2023; Kılıçarslan et al., 2024; Mele et al., 2025).

2. Literature review

2.1. Visitor engagement

In the cultural heritage context, the broader concept of *customer engagement* is typically referred to as *visitor* (or *tourist*) *engagement*. Both in the tourism and marketing literature, engagement has evolved to become a widely adopted metric (Brodie et al., 2011; So et al., 2021), which has been shown to influence both customer (e.g. loyalty, revisit intention) and firm (e.g. profitability) outcomes (Rasoolimanesh et al., 2021). Correspondingly, engagement may be viewed from the engagement subject's (e.g. the customer's) perceived cost/benefit perspective (i.e. what will be gained from [vs. what will it cost] engaging with a tourism brand; Hollebeek, 2011). In the remainder of this section, we outline widely agreed-upon tenets of visitor engagement.

First, prior authors typically concur regarding engagement's *interactive* nature (e.g. Charry et al., 2024). Here, *interactivity* has been denoted as 'mutual or reciprocal action or influence' (Vargo & Lusch, 2016, p. 9). Engagement thus centers on an individual's (e.g. a tourist's) interactions with a (e.g. hotel or airline) brand or brand-related element(s) (e.g. the brand's social media or advertising content), differentiating it from related concepts like involvement or attachment, which do not take an interactive focus (e.g. Zaichkowsky, 1985).

Second, engagement reflects an engaging individual's (e.g. a visitor's) investment of their personal (e.g. cognitive or emotional) resources in their interactions with a brand or brand-related object (Hollebeek et al., 2019a). Therefore, those investing extensive resources are viewed to exhibit high engagement, and vice versa (So et al., 2021). The literature has traditionally proclaimed that fostering individuals' elevated engagement is predicted to yield superior organisational returns (e.g. loyalty or profitability; So et al., 2021).

Third, visitor (and tourist) engagement is typically operationalised as a multidimensional construct comprising cognitive, emotional, and behavioural facets (e.g. Hollebeek et al., 2014; So et al., 2021). In fact, a recent comparison of 28 engagement scales reveals that only 2 modelled

engagement unidimensionally (Hollebeek et al., 2023b). Moreover, while some authors add a social engagement dimension (Brodie et al., 2013), this may lack relevance in some contexts. Likewise, Harrigan et al. (2017) propose cognitive (i.e. attention/absorption), affective (i.e. identification/emotive connection), and behavioural (i.e. participation) engagement, as adopted in this research.

A growing body of research has examined how visitor experiences act as catalysts for engagement within cultural and/or heritage contexts, shaping visitors' behavioural intentions (Jiang et al., 2023b; Omran et al., 2024; Shafiee et al., 2020). Building on these insights, we suggest viewing engagement not only as an outcome of the visitor experience, but also as a driver that can sustain and extend future connections with the site over time and through different formats.

2.2. Technology-enhanced visitor engagement

Emerging technologies, including augmented reality (AR), virtual reality (VR), and mixed reality (MR), are increasingly being adopted by museums and heritage sites to stimulate engagement (Buhalis et al., 2023; Flavián et al., 2021; Neuhofer et al., 2014). A growing body of research has explored how these tools may enhance the pre-visit experience (Ahmad et al., 2023; Rather et al., 2025), deepen on-site interactions by instilling meaning and interactivity (Baran & Karaca, 2024; Griffin et al., 2023; Huang et al., 2025), and even sustain visitors' connection to the site after their visit (e.g. through fully remote repeat visits; Geng et al., 2024). While such technology-mediated experiences have typically been examined as antecedents of engagement, they can also be understood as outcomes. Recent contributions further point to their capacity to act as conduits for extended relationship-building with cultural sites remotely and over time (Deng et al., 2025).

Specifically, AR applications, such as mobile apps or smart glasses, like Microsoft HoloLens, superimpose digital content onto real-world artefacts, stimulating cognitive engagement by promoting attention, learning, and mental imagery as users process contextual information and develop a deeper understanding of the site (Flavián et al., 2021; Jiang et al., 2023b; Ngan & Lei, 2025). In contrast, VR experiences, ranging from non-immersive formats on desktops to fully immersive environments via head-mounted displays like Meta Quest 2, tend to activate emotional and behavioural engagement by offering hedonic, interactive, and sensory-rich environments (Baker et al., 2023). These may stimulate affective responses and drive intention to act, such as revisiting or recommending the site (Medai & Wu, 2023; Ngan & Lei, 2025). However, these technologies are not without limits: while they may enhance memorability and presence, they may also risk diverting attention away from cultural or historic artefacts, diluting the cultural depth of the experience (Suhartanto et al., 2021; Zhu et al., 2024).

This shift toward *phygital* experiences, blending physical and virtual elements, is increasingly viewed as a continuum (vs. binary; Mele et al., 2025; Trunfio et al., 2022). Specifically, scholars have argued that such phygital experiences can generate symbolic, economic, and relational value across all stages of the visitor journey, from pre- to post-visit, yet further research is needed to understand how engagement stimulated on-site translates into long-term *behavioural intentions* across these formats (Hollebeek et al., 2023a; Deng et al., 2025; Yang & Wang, 2025).

2.3. Revisit intentions across technological visitation formats

Revisit intention (RI) denotes a visitor's resolve to (traditionally, physically) revisit a site (Yoon & Uysal, 2005). While RI has been extensively investigated in physical contexts, digital and immersive technologies have opened new avenues for reconceptualizing how such intentions manifest. Specifically, destinations are increasingly offering technology-enhanced revisit experiences, such as on-site AR, VR, or MR overlays or online tours, that extend visitor engagement beyond the physical encounter (Neuhofer et al., 2014; Carrasco-García et al., 2025; Deng et al., 2025).

Despite this evolution, prior research has tended to conceptualise such technologies as either pre-visit stimuli or tools to enrich the on-site experience and boost physical RI (Ahmad et al.,

2023; Flavián et al., 2021), overlooking the role of visitors' engagement that may be cultivated during their physical site visit as a driver of post-visit intentions. Recent contributions highlight the role of physical (or virtual) presence in shaping visitors' emotional and cognitive responses, in turn influencing loyalty and physical site revisit intent (Jiang et al., 2023a; Yung et al., 2021). Less attention, however, has been afforded to the role of visitors' actual on-site presence in sustaining their engagement and fostering their future connection with cultural heritage sites through digital means (Rather et al., 2025; Suhartanto et al., 2021).

Relatedly, what we refer to as *technology-enhanced revisit intention* (T-RI) describes visitors' intention to physically return to the site using on-site immersive technology like head-mounted displays, smart glasses, users' smartphones, or immersive projections, among others (Trunfio et al., 2022). Likewise, *virtual revisit intention* (V-RI) reflects visitors' intention to remotely revisiting the site (i.e. reliving the experience, without physically returning to it) by using, for example, head-mounted displays or Metaverse-based site visits (Ngan & Lei, 2025).

These extensions align with the growing hybridisation (or *phygitalisation*) of cultural heritage experiences and with emerging calls to explore post-travel engagement dynamics (Carrasco-García et al., 2025). They may also contribute to the development of new conceptual constructs (Trunfio et al., 2022), offering a more comprehensive understanding of visitor engagement as not merely a momentary interaction, but the starting point of sustained and multidimensional visitor – site relationships.

3. Conceptual model and hypothesis development

Building on prior engagement research that has conceptualised engagement as a multidimensional construct influencing visitors' loyalty intentions (Rasoolimanesh et al., 2021; Rasul et al., 2024), this study adopts the model of Fishbein (1967), which models attitude as consisting of three interrelated components: cognitive, affective, and conative. While some studies interpret this model hierarchically, assuming a sequential progression from cognition to affect, followed by conation (e.g. Perez Benegas & Zanfardini, 2023), following Seyfi et al. (2024), we treat the antecedents' components as co-existing rather than sequential. Although both constructs share the C/A/B components, we focus on engagement as a dynamic, situationally activated state that directly predicts behavioural intentions, whereas attitudes represent more enduring outcomes (Hollebeek & Macky, 2022). Moreover, we conceptualise visitor engagement as a multidimensional construct that comprises cognitive, affective, and behavioural dimensions. This approach has been frequently employed to investigate user engagement (Bryce et al., 2015; Harrigan et al., 2017) and behavioural intention (Han et al., 2011). In particular, engagement dimensions such as identification, enthusiasm, attention, absorption, and interaction have been shown to predict behavioural outcomes (Harrigan et al., 2017; So et al., 2014), though their explanatory role across different formats remains under-explored. Against this backdrop, this study develops the conceptual framework and related hypotheses by examining how visitor engagement dimensions shape revisit intentions across different visitation formats (i.e. RI, T-RI, V-RI).

3.1. Cognitive engagement and revisit intentions

Cognitive engagement reflects a visitor's level of mental elaboration of a brand-related object (e.g. a cultural heritage site; Hollebeek et al., 2014). Harrigan et al. (2017) propose that cognitive engagement comprises three sub-dimensions: attention, absorption, and enthusiasm. While attention refers to the individual's mental focus on the destination, absorption refers to the individual's level of immersion or engrossment in the destination, and enthusiasm represents intense interest in the destination.

Prior research suggests that higher cognitive engagement implies the individuals' greater scrutiny and elaboration of destination information raising their revisit intention, including for cultural

heritage sites (Cheung et al., 2023). Specifically, engaged individuals are likely to develop a deeper connection with, and commitment to, the destination, inciting their desire to return to it (Bryce et al., 2015). We therefore posit:

H1a: Visitors' cognitive engagement positively affects their (physical) revisit intention (RI).

The adoption of new technologies in cultural heritage settings provides a unique avenue to enhance cognitive engagement. Specifically, these technologies offer immersive experiences that are expected to deepen visitors' mental elaboration of the site (e.g. by fostering their absorption with it; Kim et al., 2020; Rather et al., 2025). Visitors displaying elevated cognitive engagement are likely to re-connect with the site through technology-enhanced formats (Ngan & Lei, 2025; Yung et al., 2021; Zhu et al., 2024). In other words, the immersive nature of AR and VR helps visitors visualise and interact with the destination in ways that traditional methods cannot, fostering their deeper connection with, and their intent to revisit, it. We postulate:

H1b: Visitors' cognitive engagement positively affects their technology-enhanced (on-site) revisit intention (T-RI).

Virtual tours enabled, for instance, by Metaverse technology, allow visitors to continue exploring the site remotely, supporting ongoing learning, reflection, and attachment (Ahmad et al., 2023; Deng et al., 2025). Virtual technologies offer a simulated experience that is likely to evoke visitors' cognitive resource investments (e.g. of their attention or concentration) in the destination site (Flavián et al., 2021). Prior research shows that high cognitive engagement in virtual environments is conducive to satisfaction and loyalty, which are crucial in terms of driving revisit intentions (El-Said & Aziz, 2022). In addition, virtual technologies offer a convenient way for visitors to reconnect to the destinations (Huang et al., 2025). This is particularly relevant for visitors who experienced strong cognitive engagement during their initial visit, as they may perceive virtual revisit options as meaningful opportunities to maintain and deepen their connection with the site, enabling continued exploration when physical access is limited or not preferred (Yung et al., 2021). We hypothesise:

H1c: Visitors' cognitive engagement positively affects their virtual (remotely) revisit intention (V-RI).

3.2. Emotional engagement and revisit intentions

Emotional engagement reflects visitors' investment of their affective resources in relation to a brand or brand-related object (e.g. a cultural heritage site; Hollebeek et al., 2014, 2019a). In the heritage context, it encompasses visitors perceived meaning of, and affective connection to, a site's historic and symbolic elements, in turn strengthening the site's perceived identity and authenticity, while also lifting their commitment and loyalty to it (Li et al., 2024). For example, the site's social and environmental attributes (e.g. by connecting visitors to the past) are likely to facilitate the development of meaningful, memorable experiences that influence visitors' emotional engagement (Steriopoulos et al., 2024). We therefore anticipate that visitors who exhibit high emotional engagement with a cultural heritage site, are likely to develop a strong attachment to it, raising their physical revisit intention. We postulate:

H2a: Visitors' emotional engagement positively affects their (physical) revisit intention (RI).

Beyond encouraging physical return, emotional engagement experienced on-site may also play a key role in the future visits adopting new technologies. Intense emotional engagement can enhance visitors' intent to use technologies such as AR and VR, which are designed to foster immersive experiences that deepen users' emotional connections (Yung et al., 2021). In heritage sites, such technologies allow users to engage with the site's historic elements in more interactive, emotionally resonant ways (Jiang et al., 2023b). As visitors emotionally engage with these technologies (Hollebeek & Belk, 2021), they are likely to develop a strong attachment to the cultural heritage site,

raising their likelihood of revisiting it by using technology-enhanced tools. Technologically enhanced emotional engagement can thus create a compelling, memorable experience, lifting visitors' intention to revisit a technology-enhanced version of the site (Seyfi et al., 2024). We theorise:

H2b: Visitors' emotional engagement positively affects their technology-enhanced (on-site) revisit intention (T-RI).

The relationship between visitors' emotional engagement and their virtual (remotely) revisit intention represents an area of emerging interest. Technologies such as VR and Metaverse platforms offer emotionally immersive environments that can sustain and even deepen affective bonds with cultural heritage sites beyond the constraints of physical presence (Ahmad et al., 2023; Deng et al., 2025). Visitors' virtual emotional engagement can foster strong affective connections, which are conducive to raising loyalty and remote or virtual revisit intentions, especially when in-person access is restricted or less feasible (Medai & Wu, 2023). As virtual experiences have the capacity to evoke significant emotional responses and create lasting memories, emotional engagement is suggested to raise a virtual (remotely) revisit intention, thus underscoring the importance of affect in creating memorable virtual engagement, which in turn is proposed to boost revisit intentions, not merely as substitutes, but as emotionally valuable extensions of the original encounter (Li et al., 2024). We therefore posit:

H2c: Visitors' emotional engagement positively affects their virtual (remotely) revisit intention (V-RI).

3.3. Behavioural engagement and revisit intentions

Behavioural engagement reflects a visitor's investment of time, energy, and effort in their interactions with a brand or a brand-related object (e.g. a cultural heritage site; Hollebeek et al., 2014). As such, behavioural engagement is thought to comprise visitors' active participation and effort in interacting with a destination (So et al., 2014), including by travelling to and visiting an attraction site, participating in on-site events (e.g. cultural heritage festivals), and carrying out cultural practices (Seyfi et al., 2024). Visitors who exhibit high behavioural engagement with a cultural heritage site are likely to develop a strong connection and attachment to it (Cheung et al., 2023), in turn raising their (physical) revisit intention. We postulate:

H3a: Visitors' behavioural engagement positively affects their (physical) revisit intention (RI).

The integration of technology in cultural heritage sites permits the development of visitors enhanced interactive experiences that can boost their behavioural engagement with the site (Itani & Hollebeek, 2021). When visitors experience a site enhanced with immersive technology, they tend to invest additional time and effort in their interactions with it (e.g. given the immersive nature of their site experience; Neuhofer et al., 2014; Zhu et al., 2024). Such heightened, technologically driven engagement (Hollebeek & Belk, 2021) not only enhances visitors' site visit experience but also fosters a deeper connection to the destination (Rather et al., 2025). As visitors' engagement with the site rises through the adoption of these technologies (Ngan & Lei, 2025), their intention to physically revisit a technologically enhanced version of the site is likely to increase (Medai & Wu, 2023; Yung et al., 2021). We suggest:

H3b: Visitors' behavioural engagement positively affects their technology-enhanced (on-site) revisit intention (T-RI).

Virtual (e.g. Metaverse) tours present an opportunity for visitors to remotely engage with cultural heritage sites, which may be particularly appealing during times when physical travel is restricted (Lavan et al., 2024). Behavioural engagement in virtual or digital environments involves visitors' active investment of their time, energy, and effort in virtual site tours (e.g. by interacting with digital content and other avatars or by learning about the site), in turn likely immersing them in

the visit experience and raising their attachment to the site and also fostering a sense of social connection (Geng et al., 2024; Rather et al., 2025; Yung et al., 2021). While previous studies have highlighted virtual experiences primarily as pre-visit tools or substitutes for physical visits (Leung et al., 2022; Manchanda & Deb, 2022), we suggest that visitors displaying behavioural engagement with a virtual destination site are likely to develop a strong connection to it and an intent to revisit it virtually, even post-visit (Medai & Wu, 2023). We propose:

H3c: Visitors' behavioural engagement positively affects their virtual (remotely) revisit intention (V-RI).

3.4. Effect of technology-enhanced revisit intention on virtual revisit intention

Engaging with these new technologies during an on-site visit may create a gateway for extended digital interaction post-visit. These hybrid, *phygital* experiences, where physical and digital elements blend seamlessly, can enhance flow, memorability, and inspiration, fostering a continued relationship with the site across time and formats (Deng et al., 2025; Mele et al., 2025). When visitors perceive augmented or virtual reality not merely as enhancements but as part of a broader experiential continuum, they may interpret virtual revisits as meaningful follow-ups rather than mere substitutes (Ahmad et al., 2023; Medai & Wu, 2023). In fact, engagement with a technology-enhanced representation of the site may spill-over into visitors' engagement with a purely virtual and remote representation of the site (Hollebeek et al., 2023a). This continuity may reflect a shifting paradigm in heritage engagement, where visitors accustomed to technological integration begin to see virtual pathways as natural extensions of prior experiences (Pan et al., 2021; Yang & Wang, 2025). Moreover, visitors' growing technological readiness further facilitates this transition (Kim et al., 2020). We therefore expect a positive effect of visitors' intention to revisit a technology-enhanced version of the site on their intention to virtually revisit, as follows:

H4: Visitors' technology-enhanced (on-site) revisit intention (T-RI) positively affects their virtual (remotely) revisit intention (V-RI).

4. Methodology

4.1. Research context and data collection

Data was collected using an on-site intercept survey of visitors to the archaeological site of Pompeii to assess visitors' engagement and their revisit intentions across the three formats. The National Archaeological Park of Pompeii (hereafter Pompeii or 'the Park') was selected as the research context for several reasons. First, as a UNESCO World Heritage Site since 1997 and one of the world's most visited archaeological destinations, consistently among the top two in Italy, Pompeii attracts approximately two million international visitors annually (MiC, 2021), offering extraordinary heterogeneity in visitors' countries of origin. Following a temporary decline during the pandemic, visitation levels have returned to figures comparable to pre-pandemic levels, underscoring the site's continued relevance and attractiveness to global visitors (Pompeii, 2024). Second, the site's ongoing archaeological discoveries, which periodically reveal new areas and artefacts, help sustain visitor interest and engagement over time, offering them reasons to reconnect with the site even after their initial visit (Pompeii, 2025). Third, the Park, which is investing in (e.g. social media) communications, launched the '*MyPompeii*' mobile application, which allows visitors to access audio guides and explore various parts of the park virtually in real-time (see Figure 1). Examining visitors' engagement at Pompeii and their intentions to maintain or renew their connection with the site across different visitation formats provides a valuable opportunity to understand how heritage sites can leverage technology to extend the impact of physical visits and enhance their digital readiness.

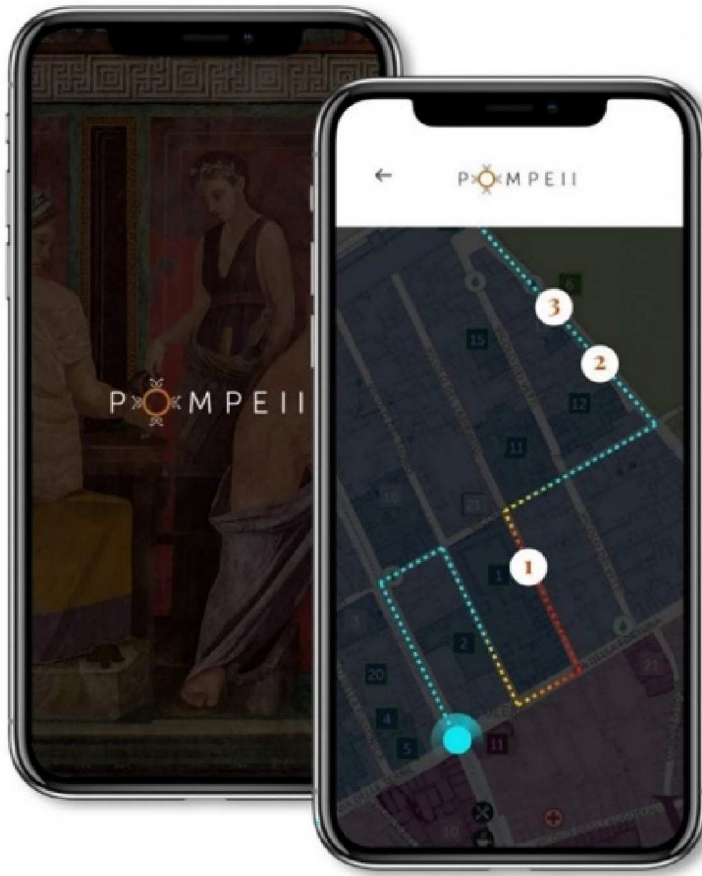


Figure 1. 'MyPompeii' Application. Source: <https://pompeisites.org>.

The research was conducted with official authorisation from the Park's management, aligning with its strategic interest in exploring how digital technologies can enhance visitor experiences and sustain engagement over time. Finally, adopting a single, well-defined research setting is a widely used and valuable approach in heritage and tourism research, as it allows for an in-depth and context-sensitive analysis of visitor engagement dynamics, while generating insights that may be transferable to similar heritage sites (e.g. Huang et al., 2025; Rather et al., 2025).

Convenience sampling with time-location intercepts across different times and areas of the Park was adopted to reduce selection bias, with visitors invited on-site to complete an anonymous self-administered questionnaire (Yüksel, 2017). To reduce potential social desirability bias, items were neutrally worded and presented in a random order, preventing those from the same dimension from appearing consecutively (Nederhof, 1985).

The questionnaire was reviewed by four scholars in tourism and marketing to ensure clarity and content validity. A pilot test with 21 undergraduate students who had previously visited Pompeii was then conducted to confirm only the reliability and comprehensibility of the measures (Carrasco-García et al., 2025). The final questionnaire, developed using Microsoft Forms, was disseminated to the respondents, who were intercepted on-site by the leading author along with an authorised group of eight researchers who approached visitors during their Sunday visits from March to June 2023. Respondents were invited to access the survey by scanning a QR code with their smartphones.

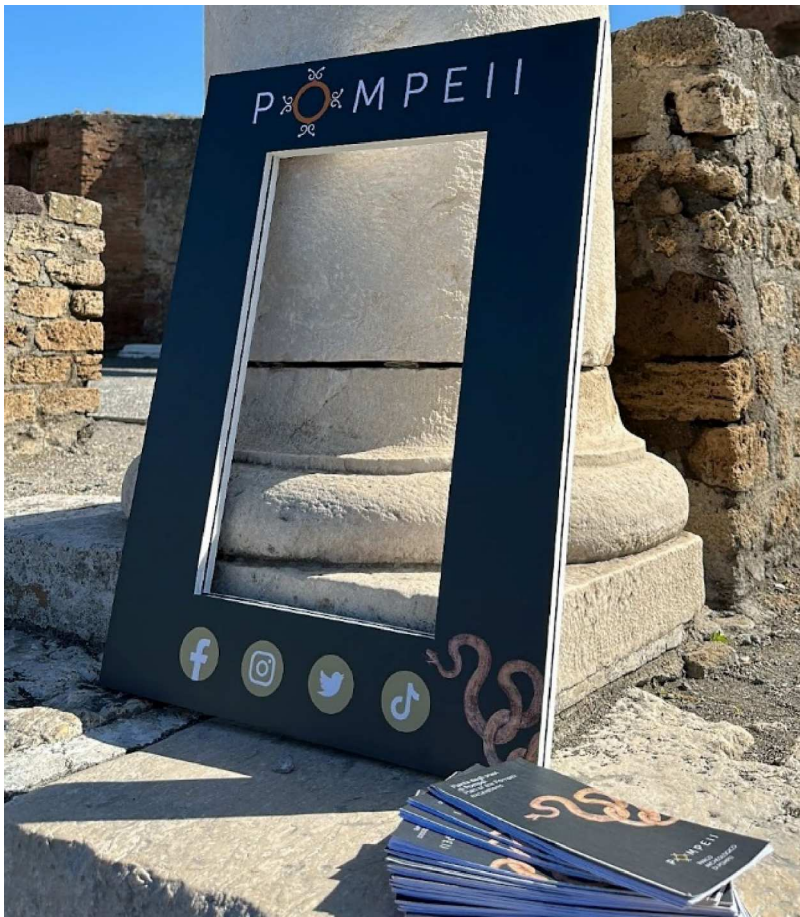


Figure 2. Branded photo frame. Source: authors.

To further encourage participation, branded photo frames for taking pictures and site maps with basic information were made available to visitors (see [Figure 2](#)). We obtained 572 valid responses (please refer to [Table 1](#) for the respondents' demographic profile).

4.2. Measures

In line with Kline, dimensions adopted in this research were measured by using multi-item scales adapted from prior studies. We adopted Rasoolimanesh et al.'s (2021) scale, which builds on that of So et al. (2014) and consistent with the multidimensional operationalisation highlighted in Seyfi et al. (2024) to gauge visitor engagement, comprising sixteen items across five aspects: enthusiasm, attention, absorption, interaction, and identification. Following Yoon and Uysal (2005), visitors' (physical) revisit intention (RI) was measured using two 7-point Likert items (propensity to recommend the site to friends/relatives and the individual's overall resolve to return), in line with Jiang et al. (2023b).

Visitors' technology-enhanced (on-site) revisit intention (T-RI) and their virtual (remotely) revisit intention (V-RI) were measured by using three-item, 7-point Likert scale adapted from Christensen et al. (2025), consistent with prior tourism studies grounded in the Technology Acceptance Model (TAM) (Carrasco-García et al., 2025; Liu & Park, 2024).

Table 1. Respondent profile (N = 572).

	Characteristics	N.	%
Gender	Male	257	44.9%
	Female	303	53.0%
	Non-binary	6	1.0%
	Prefer not to say	6	1.0%
Age	Under 18	23	4.0%
	18–24	131	22.9%
	25–34	194	33.9%
	35–44	88	15.4%
	45–54	59	10.3%
	55–65	56	9.8%
	Over 65	21	3.7%
Travel Companion	Solo traveler	39	6.8%
	Partner	155	27.1%
	Family	153	26.7%
	Friends	213	37.2%
Motives	Colleagues	12	2.1%
	Culture	414	72.4%
	Entertainment	126	22.0%
	Religion	11	1.9%
	Study/research	14	2.4%
	Work	7	1.2%
Times of visit	First time	310	54.2%
	Once before	117	20.5%
	2–5 times before	121	21.2%
	6–10 times before	10	1.7%
	>10 times before	14	2.4%
Technology engagement	Website	262	45.8%
	Social media	113	19.8%
	Mobile app	92	16.1%
	No technology use	89	15.5%
Country	Italy	218	38.1%
	Other European Countries (incl. the UK)	198	34.6%
	USA and Canada	57	10.0%
	Central and Latin America	15	2.6%
	Asia, Middle East (incl. Türkiye) and the Far East	63	11.0%
	Australia and New Zealand	11	1.9%
	Africa	10	1.7%

4.3. Data analysis

Given the context-dependent nature of customer engagement (Brodie et al., 2011; Hollebeek et al., 2019a; So et al., 2014), we verified the attained visitor engagement data on the proposed engagement dimensions of enthusiasm, attention, absorption, interaction, and identification (Harrigan et al., 2017). A principal component analysis (PCA) with varimax rotation revealed that several items had factor loadings below .60, cross-loadings above .40, and/or communalities below .50. After removing these items, the analysis revealed a four-factor structure of visitor engagement in the cultural heritage context (see Appendix A). In particular, enthusiasm and attention merged into a single four-item dimension (labeled Attraction), comprising two items from each of the original sub-scales (Harrigan et al., 2017). This approach aligns with Harrigan et al. (2017), who conceptualise both attraction and absorption as components of cognitive engagement, and consequently classify the three identification items as emotional engagement and categorise the three interaction items as behavioural engagement. In addition, one item originally designed to measure interaction was removed due to weak psychometric performance, resulting in a two-item construct. The use of two items to represent a narrowly defined and theoretically sound dimension is considered acceptable and is supported by prior research in psychometrics and marketing (Bergkvist & Rossiter, 2007; Hair et al., 2019; Leung et al., 2022). After validating the measurement model through confirmatory factor analysis (CFA), following the Anderson and Gerbing procedure, we tested the proposed

hypotheses using structural equation modelling (SEM) in SPSS Amos v.20.0. The results are presented in the following section.

5. Results

5.1. Sample characteristics and descriptive statistics

Table 1 summarises the respondent profile, revealing that 53% of the respondents were female (43.9% male) and the remainder were non-binary or undisclosed. In terms of visit frequency, 54.2% of interviewees reported this was their first visit to Pompeii, while 45.8% indicated having previously visited the park. Most of the respondents were aged between 25 and 34 (33.9%), travelled with friends (37.2%), and identified as cultural travellers (72.4%), reinforcing the suitability of the research context. While the participants were mostly from Italy (38.1%) or other European countries (34.6%), the remainder came from the USA, Canada, Central and Latin America, Asia, and Oceania, among others (27.3%), confirming Pompeii's global appeal. To complement the demographic profile, we explored respondents' interaction with the existing Park's digital platforms. Specifically, 45.8% had consulted the official website (57.6% of whom were repeat visitors); 19.8% had engaged with the park's social media (91.2% of whom were repeaters); and 16.1% had used the *MyPompeii* app (with 59.8% being repeat visitors). Conversely, 44.9% of respondents reported not having used any digital platform; notably, 65.4% of these were first-time visitors. These patterns already offer initial descriptive insights: visitors who are more familiar with the site seem more likely to engage with the digital tools provided by the Park.

5.2. Measurement model assessment and confirmatory factor analysis results

Confirmatory factor analysis (CFA) was executed to establish the measurement model's adequacy, evaluate its reliability, and demonstrate the convergent and discriminant validity of the measures. Overall, the model reveals a good fit to the data: ($\chi^2 = 344.906$, $df = 147$, $\chi^2/df = 2.346$, CFI = .971, TLI = .963, SRMR = .0407, RMSEA = .049, p-close = .630). **Table 2** shows the Cronbach's alpha coefficients and standardised factor loading produced by CFA. Cronbach's alpha and composite reliability (as reported in **Table 3**) values exceeded the value of .70, indicating construct reliability (Nunnally, 1994). For (physical) revisit intention, the attained values were slightly less than .70 (but well above .6), reflecting adequacy for studies in the social sciences (Hair et al., 2019).

As shown in **Table 3**, the Average Variance Extracted (AVE) and CR values were above .50 and .70, respectively (Hair et al., 2019), indicating satisfactory convergent validity. The only exception is the CR value for visitors' (physical) revisit intention, which, while slightly below the suggested criterion, is well above .60, indicating its adequacy for social science research. We adopted the conservative approach, using the AVE criterion, to establish discriminant validity. As shown in **Table 3**, the AVE for each construct is greater than the variance shared between that construct and the other constructs, indicating discriminant validity (Hair et al., 2019).

5.3. Structural model assessment and hypothesis testing

The relationships among the latent dimensions were assessed by running the overall structural model. **Figure 3** displays the path diagram and estimates the model's overall fit parameters. The χ^2 equals 346.601 ($df = 149$; $p < 0.000$), and the χ^2/df equals 2.326. In addition, the CFI is .971, TLI is .963, SRMR is .0414, RMSEA is .048, and p-close is .664. These values align with their respective thresholds, demonstrating that this study produced a statistically valid hypothesis-testing model (Hair et al., 2019).

Table 4 reports the standardised coefficients for the model's paths with their associated t- and p-values, and whether the hypothesis is supported. In particular, the results show that attraction (path

Table 2. Confirmatory factor analysis and measurement model results.

Dimension and item code	Statement	Std. factor loading	t-value	Cronbach's α
<i>Attraction</i>				.809
AT1	I pay a lot of attention to anything about this site	0.758		
EN2	I am interested about this site	0.819	17.072	
EN1	I am heavily into this site	0.718	14.337	
AT2	Anything related to this site grabs my attention	0.665	14.599	
<i>Absorption</i>				.818
AB4	When interacting with this site, it is difficult to detach myself	0.808		
AB3	When I am interacting with this site, I get carried away	0.792	15.477	
AB2	Time flies when I am interacting with this site	0.844	16.418	
<i>Identification</i>				.840
ID1	When someone criticises this site, it feels like a personal insult	0.805		
ID2	When I talk about this site, I usually say 'we' rather than 'they' because the identity of the site suits me	0.712	17.643	
ID3	When someone praises this site, it feels like a personal compliment	0.9	21.018	
<i>Interaction</i>				.918
IN2	I like to actively participate in this site's community discussions	0.97		
IN3	I thoroughly enjoy exchanging ideas with other people in this site's community	0.876	20.021	
<i>Revisit intention (RI)</i>				.679
RI3	I would visit this site more often in the next few years	0.697	-	
RI2	I would encourage friends and relatives to visit this site	0.74	9.347	
<i>Technology-enhanced revisit intention (T-RI)</i>				.931
T-RI1	In the future, I intend to revisit this site by using new immersive technologies (e.g. virtual and augmented reality)	0.862		
T-RI2	In the future, I will plan to always revisit this site by using new immersive technologies (e.g. virtual and augmented reality)	0.983	34.146	
T-RI3	In the future, I will recommend using new immersive technologies (e.g. virtual and augmented reality) when visiting this site	0.874	29.042	
<i>Virtual revisit intention (V-RI)</i>				.929
V-RI1	In the future, I intend to virtually revisit this site rather than coming in person	0.832		
V-RI2	In the future, I will always plan to virtually revisit this site rather than coming in person	0.919	28.946	
V-RI3	In the future, I will recommend to others to do the same (virtually revisit this site rather than in person)	0.961	30.287	

coefficient = .215; $t = 3.286$; $p < .01$) and absorption (path coefficient = .267; $t = 3.92$; $p < .001$) both exert a significant, positive effect on revisit intention (RI), but do not affect the intention to revisit a technology-enhanced (T-RI) or a virtual (V-RI) representation of the site. Consequently, H1a is supported, and H1b and H1c are not. It is worth noting that absorption impacts participants' T-RI at $p < .1$.

Furthermore, standardised coefficients and p -values suggest that identification has a significant, positive effect on RI (path coefficient = .251; $t = 4.297$; $p < .001$), on T-RI (path coefficient = .246; $t =$

Table 3. Discriminant validity assessment.

	Attraction	Absorption	Identification	Interaction	RI	T-RI	V-RI	AVE	CR
Attraction	0.742							0.551	0.830
Absorption	0.585	0.815						0.664	0.856
Identification	0.196	0.311	0.809					0.655	0.849
Interaction	0.236	0.334	0.456	0.924				0.854	0.921
RI	0.415	0.465	0.373	0.242	0.719			0.517	0.681
T-RI	0.142	0.208	0.300	0.191	0.206	0.908		0.824	0.933
V-RI	0.093	0.156	0.257	0.285	0.091	0.198	0.906	0.820	0.932

Notes: The bolded diagonal reports the square roots of the AVE; RI: (physical) revisit intention; T-RI: technology-enhanced revisit intention; V-RI: virtual revisit intention.

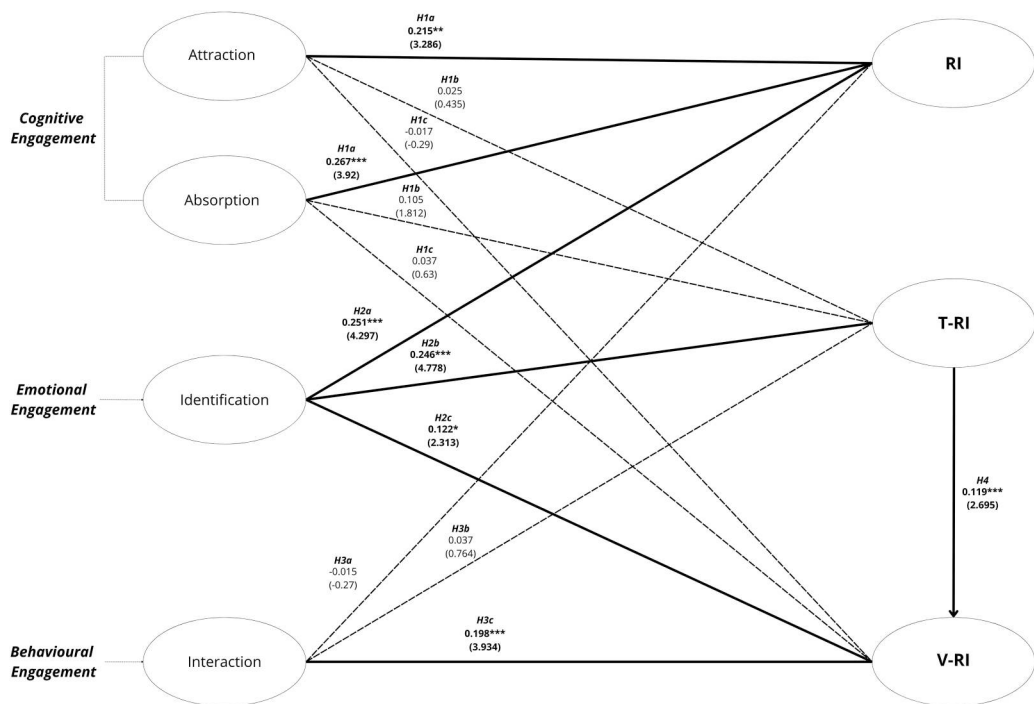


Figure 3. Path diagram.

Notes: Dashed line = Not supported; Bolded line = supported; *** $p < 0.001$; ** $p < 0.02$; * $p < 0.05$.

Table 4. Path analysis and hypothesis testing results.

Hypothesis			Std. Estimate (β)	t-value	p-value	
H1a	Cognitive	ATTR \Rightarrow RI	0.215	3.286	0.001	Supported
H1a	Cognitive	ABS \Rightarrow RI	0.267	3.92	0.000	Supported
H1b	Cognitive	ATTR \Rightarrow T-RI	0.025	0.435	0.663	Not Supported
H1b	Cognitive	ABS \Rightarrow T-RI	0.105	1.812	0.07	Not Supported
H1c	Cognitive	ATTR \Rightarrow V-RI	-0.017	-0.29	0.772	Not Supported
H1c	Cognitive	ABS \Rightarrow V-RI	0.037	0.63	0.528	Not Supported
H2a	Emotional	IDE \Rightarrow RI	0.251	4.297	0.000	Supported
H2b	Emotional	IDE \Rightarrow T-RI	0.246	4.778	0.000	Supported
H2c	Emotional	IDE \Rightarrow V-RI	0.122	2.313	0.021	Supported
H3a	Behavioural	INT \Rightarrow RI	-0.015	-0.27	0.787	Not Supported
H3b	Behavioural	INT \Rightarrow T-RI	0.037	0.764	0.445	Not Supported
H3c	Behavioural	INT \Rightarrow V-RI	0.198	3.934	0.000	Supported
H4		T-RI \Rightarrow V-RI	0.119	2.695	0.007	Supported

4.778; $p < .001$) and V-RI (path coefficient = .122; $t = 2.313$; $p < .05$), thus supporting H2a, H2b, and H2c. Finally, H3 address the impact of interaction on RI (H3a), to T-RI (H3b), and V-RI (H3c). The results indicate that interaction (path coefficient = .198; $t = 3.934$; $p < .001$) has a significant, positive effect on V-RI only. Therefore, while H3c is supported, H3a and H3b are not.

Finally, the results show that T-RI has a significant, positive effect on V-RI, supporting H4. The model explains a satisfactory amount of variance in RI ($R^2 = .303$), T-RI ($R^2 = .107$), and V-RI ($R^2 = .115$), with the latter two representing the introduced constructs in this study. These R^2 values fall within acceptable thresholds for exploratory models (Hair et al., 2019).

6. Discussion, implications, limitations, and future research

6.1. Discussion

We explored the differential predictive role of engagement dimensions in the context of cultural heritage sites across three distinct revisit intentions, each associated with different visitation formats: the traditional physical one, a technology-enhanced one, and a fully virtual representation of the site – formats that have received little prior attention in the literature. In doing so, we shifted the focus from technological factors as the primary drivers of engagement, as emphasised in prior studies (e.g. Flavián et al., 2021; Huang et al., 2025), to engagement's capacity to stimulate revisit intentions across different visitation formats (traditional, technology-enhanced, and virtual). We thus addressed the outlined gap by drawing on Fishbein's (1967) model of attitude formation, recently applied to visitor engagement in tourism research (Seyfi et al., 2024). We conceptualise engagement as a multidimensional attitude state (cognitive, emotional, and behavioural) (Harrigan et al., 2017), linked to format-specific conative outcomes (RI, T-RI, V-RI). A survey was developed to test our hypotheses using SEM.

We found that revisit intentions in the context of cultural heritage sites transpire as the result of each engagement dimension, linking visitors' intentions to technologically enhanced or virtual revisits to their previous (e.g. physical) site visit experience. The findings also reveal that cognitive engagement (the emerging 'attraction' and absorption) significantly and positively influences visitors' (physical) revisit intention, in line with prior studies (Hollebeek et al., 2023a). However, cognitive engagement was not found to significantly impact visitors' intent to revisit a technology-enhanced or a virtual representation of the site. This may be due to the nature of cognitive engagement, which primarily focuses on information processing and comprehension (Hollebeek et al., 2014), rather than experiential or technological aspects that facilitate remote or technology-enhanced visits (Ngan & Lei, 2025). For cultural heritage sites, this suggests that technological-enhanced and virtual revisits may depend less on cognitive elaboration and more on emotional resonance or habitual connection, challenging the notion of a linear cognitive-to-virtual pathway (Yung et al., 2021).

Conversely, emotional engagement (identification) was found to significantly and positively affect all three types of revisit intentions (i.e. RI, T-RI, and V-RI), aligning with previous studies that emphasise its role in fostering personal connections, long-term memories, and loyalty (Hollebeek et al., 2019a). Through visitors' identification with authentic historic elements or artefacts, emotional engagement strengthens their commitment and intent to revisit cultural heritage sites, sustaining their connection across spatial and technological boundaries (Ahmad et al., 2023; Li et al., 2024; Stergiopoulos et al., 2024).

Interestingly, behavioural engagement (i.e. the interaction with other visitors), significantly and positively influenced only V-RI. This finding resonates with prior research (in a complementary, reverse manner) showing that participatory, interactive behaviours tend to emerge more strongly in virtual or technology-mediated contexts, where social exchange and online communities play a central role (Geng et al., 2024; Rather et al., 2025; Yung et al., 2021). Interaction was not found to shape visitors' revisit intentions either physically or in technology-enhanced format, both of which appear to rely more heavily on cognitive and emotional engagement (Hollebeek et al., 2014; Li et al., 2024). In the case of Pompeii, the site's large scale and heterogeneous visitor base may help explain this pattern: on-site interactions are typically casual and dispersed, whereas virtual environments allow for more focused and enduring social connections, fostering symbolic and identity-driven attachments akin to a 'fan' mindset (Leung et al., 2022).

Finally, the significant effect of T-RI on V-RI supports the idea of a *phygital continuum* (Deng et al., 2025; Mele et al., 2025). Engagement with immersive technologies during a physical visit was found to create a bridge to subsequent virtual interactions (Yung et al., 2021), reinforcing recent perspectives that frame virtual revisits as natural extensions of blended cultural experiences in contexts of advanced technological affordances (Kim et al., 2020; Pan et al., 2021).

6.2. Theoretical implications

This study raises important theoretical implications. First, the findings refine current engagement theory in the cultural heritage context by providing empirical evidence of engagement's differentiated influence on individuals' intention to revisit a site in physical, technology-enhanced, or virtual format (Brodie et al., 2011; Hollebeek et al., 2019b). Specifically, the dimensions of engagement (cognitive, emotional, and behavioural) are not monolithic; rather, they differently affect revisit intentions across visitation formats (RI, T-RI, V-RI), thereby clarifying the differentiated pathways through which engagement drives loyalty-related outcomes.

Second, by applying and extending Fishbein's (1967) attitude model, the study enriches the broader attitude – behaviour literature. The results show that each engagement dimension has unique consequences, providing theoretical insight into how these components co-exist as parallel drivers of revisit intentions across visitation formats, rather than unfolding sequentially as implied by hierarchical interpretations (Perez Benegas & Zanfardini, 2023). In doing so, this research sharpens the explanatory utility of the attitude-behaviour framework in the cultural heritage context (Seyfi et al., 2024).

Third, this research reconceptualises revisit intention as a multi-format construct. Loyalty studies have largely operationalised revisit intention as the intent to return physically to a site. By introducing technology-enhanced revisit intention (T-RI) and virtual revisit intention (V-RI), this study broadens the reconsideration of revisit intention as a digitally extended behaviour. This advancement addresses recent calls to capture the evolving nature of visitor behaviour across diverse touchpoints and positions revisit intention within the wider spectrum of digital adoption in tourism (Hollebeek et al., 2019b; Carrasco-García et al., 2025; Trunfio et al., 2022).

Finally, the study contributes to emerging perspectives on digitally extended loyalty. The significant effect of T-RI on V-RI supports the notion of a phygital continuum (Deng et al., 2025; Mele et al., 2025), wherein engagement with immersive technology during physical visits acts as a bridge toward subsequent virtual revisits. This finding complements prior research that has positioned technology (usage and experience) primarily as an antecedent of engagement (e.g. Flavián et al., 2021; Huang et al., 2025) by demonstrating that technological outcomes can also emerge from (physical) visitor engagement, thereby reframing how loyalty unfolds across different visitation formats.

6.3. Managerial implications

This research also offers important implications for cultural heritage managers seeking to strengthen visitor engagement and loyalty across different formats. First, fostering emotional engagement should be a strategic priority across all visitation formats. Emotionally resonant experiences, grounded in authenticity, storytelling, and symbolic meanings, help build affective bonds that can sustain visitor – site relationships over time, regardless of physical presence. Investments in narrative design, inclusive representation, and interactive formats can reinforce these emotional ties, especially among audiences likely to engage through multiple or alternative channels (Jiang et al., 2023b; Yung et al., 2021).

Second, managers aiming to stimulate cognitive engagement and learning-driven forms of loyalty should enhance the interpretive depth of the visit through tools that promote attention, reflection, and immersion. Examples include interactive panels, expert-led routes, and layered content tailored for repeat visitors. Such strategies are particularly effective in motivating physical return and encouraging visitors to explore additional on-site opportunities (Ahmad et al., 2023; Ngan & Lei, 2025).

Third, the finding that behavioural engagement predicts virtual re-engagement underscores the importance of designing interactive, socially enriched, and community-based digital spaces. Managers could explore formats that encourage active participation, peer exchange, and shared authorship, such as virtual exhibitions, co-creation platforms, gamified community features, interactive and

rewarded loyalty programs, or social initiatives (e.g. 'virtual squares') as exemplified by the 'Earn Your Destination' initiative (Lugano, 2025). These formats do not merely replicate the on-site experience but extend its social dynamics and participatory ethos into the digital sphere, helping cultivate a sense of belonging among remote or returning visitors (Geng et al., 2024; Deng et al., 2025; Yang & Wang, 2025).

Finally, the positive effect of technology-enhanced revisit intention on the virtual revisit intention suggests that phygital experiences can act as bridges toward longer-term digital engagement. This highlights the value of designing digitally integrated visitor journeys that begin on-site but are not confined to it. Developing modular, scalable, and resilient digital offerings, particularly useful in contexts facing access constraints, can help ensure continuity of engagement, diversify audiences, and strengthen institutional resilience in the response of environmental, social, or geopolitical uncertainty (Seyitoğlu et al., 2024). Successful implementation of enhanced and virtual experiences, however, requires not only adequate infrastructure and staff training but also innovation in business models, pointing to the need for capability-building alongside content development (Botti & Baldi, 2025).

By aligning engagement strategies with the multidimensional nature of visitor relationships and the evolving affordances of technology, heritage providers can move beyond episodic visits to cultivate enduring, meaningful connections. In this regard, other stakeholders, including tourism boards, local businesses, and digital culture networks, may also benefit from engagement-oriented strategies (Kumar et al., 2025). Potential partnerships may involve integrating local products into digital visitor platforms, co-developing virtual exhibitions with community groups, or offering gamified programs that reward online participation (Baldi, 2023). Such initiatives can enhance accessibility, stimulate participation, and promote community-embedded cultural preservation in inclusive and sustainable ways.

6.4. Limitations and future research

Despite its contribution, this research has limitations that offer opportunities for further inquiry. First, this study deliberately focused on visitor engagement developed during a physical visit without incorporating other on-site experiential factors that may also shape revisit intentions. Elements such as site atmosphere, perceived authenticity, crowding, or interpretive quality may interact with engagement and influence revisit intentions across formats. Future research could integrate these experiential dimensions and, from a managerial perspective, examine how infrastructural readiness and organisational capabilities condition the effectiveness of technology-enhanced and virtual formats.

Second, the analyses were conducted within a single UNESCO World Heritage site in Italy. Although the international appeal of Pompeii and the diversity of respondents enhance the study's relevance, engagement patterns and digital receptivity may be influenced by cultural factors (Hollebeek et al., 2019a; Rasoolimanesh et al., 2021). Scholars may therefore replicate or extend the proposed research design across different cultural contexts and heritage settings to test the robustness and generalizability of the findings.

Third, the cross-sectional design provides a temporal snapshot of how visit engagement shapes revisit intentions across visitation formats. Future work is encouraged to adopt longitudinal approaches to capture the evolving dynamics of engagement over time (e.g. across the customer journey; Hollebeek et al., 2023a; So et al., 2024). Such designs would allow researchers to examine how engagement consolidates, fluctuates, or erodes, and how these temporal patterns translate into multi-format revisit intentions.

Fourth, the finding that behavioural engagement predicts V-RI suggests the emergence of new, digitally sustained forms of cultural participation. This may indicate that visitors increasingly extend their commitment through social interaction, content sharing, or platform-based engagement. Future research could examine how these behaviours contribute to the formation of informal

communities of practice or ‘heritage fans’, supporting co-creation, advocacy, and the symbolic expansion of heritage sites beyond their physical boundaries (Batat & Hammedi, 2023; Medai & Wu, 2023).

Finally, while this study explored two potentially novel (and adapted) constructs (T-RI and V-RI), their relatively modest explained variance suggests that additional predictors may influence these outcomes. Future work should continue to refine these constructs by examining alternative engagement antecedents, testing different theoretical mechanisms, and incorporating broader systemic factors. In particular, scholars may investigate how digitally mediated forms of re-engagement intersect with potential risks such as cultural commodification, over-reliance on (tourism) technologies, or increasing cost pressures on local communities. Such research could offer a more comprehensive understanding of the long-term dynamics and trade-offs involved in sustaining visitor – site relationships across evolving visitation formats.

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Author contributions

CRediT: **Giovanni Baldi**: Conceptualization, Investigation, Project administration, Visualization, Writing – original draft, Writing – review & editing

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Appendix 1. Exploratory Factor Analysis

CODE	Attraction Explained variance: 21.85%	Absorption Explained variance: 18.27%	Identification Explained variance: 18.99%	Interaction Explained variance: 16.06%
EN2	0.827			
AT1	0.798			
EN1	0.767			
AT2	0.693			
AB3		0.872		
AB4		0.783		
AB2		0.758		
ID3			0.898	
ID1			0.880	
ID2			0.733	
IN3				0.923
IN2				0.909

KMO = .786.
Bartlett's test of sphericity = 3444.583, df = 66, $p = .000$.
Note: Coefficients under .4 not reported.