

Visitors' Intentions to Use Location-Based AR Games

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Location-based AR games have been discussed as a promising means of providing visitors with meaningful experiences at cultural heritage sites, with great potential to enhance users' positive emotions and well-being. Visitors' positive emotions (fulfillment, enjoyment, and self-existence) in location-based AR games positively impact the intention to use location-based AR games.

location-based AR games

cultural heritage sites

broaden-and-build theory of positive emotions

1. Introduction

As technology advances, augmented reality (AR) is becoming increasingly prevalent in various industries, including tourism, education, medicine, entertainment, marketing, and architecture. AR technology combines visual images, sound overlays, and the physical world to provide real-world information in an interactive way [1]. The use of AR technology at cultural heritage sites is often seen as improving exhibitions, reconstructing places, and encouraging user exploration, which helps users better understand their surroundings by controlling both real and virtual objects [2][3][4]. Incorporating digital multimedia technology into cultural heritage sites can improve a visitor's experience by providing engaging and educational narratives, characters, and interactive elements [5][6]. However, an increasing number of visitors are dissatisfied with experiences like digital display screens, technological interactive exhibits, and virtual touch. The development and implementation of AR games at cultural heritage sites have become one of the creative digital tours for most cultural and heritage institutions and marketing organizations, drawing a wider variety of users. Among them, location-based AR games are now particularly popular [7] and have been recognized as a promising form of tourism experience [8], but their actual use is limited. Studies on visitors' adoption of location-based AR games or their influence on the digitalization of cultural heritage sites are still in the early stages [9][10]. Therefore, it is necessary to conduct further research on the specific factors that affect the utilization of AR games in the context of visitors' experiences.

Location-based AR games are a shared medium for generating, maintaining, and enhancing cultural heritage [11], assisting in forming visitors' public awareness and addressing visitors' engagement behaviors regarding technology adoption and user perceptions and attitudes. Location-based AR games can locate points of interest (PoI) in area-based GPS locations, including physical structures, historical and cultural objects, landmarks, etc., at cultural heritage sites. The combination of AR with mobile capabilities provides a range of experiences and gratification not found in traditional forms of media or games, as well as strengthening relationships between individuals and their social and physical environments [12]. The cultural heritage experience is a combination of innovative experiences

that integrate value and conservation, entertainment and socialization, transforming visitors into active explorers of cultural heritage sites [13]. Location-based AR games facilitate access to information about a Pol's cultural and heritage values and help users gain a rich cognitive experience and satisfaction with the destination [14][15]. Previous researchers have discussed the relationship between perceived authenticity, content, personalized service quality, and system quality on visitors' behavioral intentions [16][17]. Multiple evaluation studies have proven that museums can be perceived as instructional instruments at cultural heritage sites, and visitors corroborate the impression of utility and a high perception of enjoyment [18][19][20]. Furthermore, some studies provide insight into the perceived worth of such games in terms of users' emotions and attitudes, as well as their potential to employ this technology [21][22].

As visitors' expectations of cultural heritage sites grow more sophisticated, enhancing visitors' overall satisfaction is more likely to elicit favorable emotional reactions and result in a memorable tourism experience. As a result, highlighting gamification technology is a highly effective technique for encouraging pleasant emotions and assisting tourists in creating individually meaningful experiences. However, few studies have investigated experiences and behaviors at cultural heritage sites with such factors as positive emotions and participation. Positive emotions and engagement are essential to the tourism experience, and meaningful experiences contribute to the general well-being of travelers [23]. Positive emotions can lead to cognitive changes that increase the power of cognition and action [24].

2. The Broaden-and-Build Theory of Positive Emotions

Exploring the concept of "positive technology" is a valuable research endeavor that can enhance the fields of positive psychology and human-computer interaction. It involves creating interfaces and technologies that promote positive emotions and adaptive behavior in users. Understanding how to design such interfaces and technologies is crucial for eliciting positive emotional experiences in users [25]. The expansion and construction theory of positive emotions, a specific theory of positive psychology, highlights how positive emotions can affect cognition. This theory is useful for improving personal creativity and thinking. Researchers have found that consciously supporting people's psychological well-being can promote social prosperity. Positive emotions play a crucial role in achieving this goal [26][27][28]. Expansion and theorizing of positive emotions find empirical support in related constructs (motivation, attention, cognition, and action) and widen the range of physical, intellectual, and social resources established [29]. Understanding enjoyment is essential in positive psychology, which focuses on well-being and optimal experiences. Enjoyment refers to feelings of pleasure, whereas happiness is related to meaning and self-actualization and is interconnected with an individual's physical, mental, and social health. The concept of affective design was introduced to promote positive emotions and pleasant feelings in users. This has since been expanded to interaction design, with the goal of using technology to foster connections between individuals and to transcend the self [30][31]. Thus, the extension and establishment of the theory of positive emotions provide a satisfactory theoretical background to study the positive emotions of visitors to cultural heritage with AR technology.

Gaming has been consistently associated with positive emotional experiences [32]. In the gaming world, technology can evoke positive emotions through various paradigms. One such paradigm is the correlation between positive

emotions and social interaction. Playing games can provide players with long-lasting social connections, a sense of happiness, and subjective recognition. In addition, AR and simulated environments offer interactive experiences and physical sensations that can enhance feelings of well-being and social connectedness [33][34]. Previous tourism studies have shown that emotions affect behavioral intentions and travel destination choices [35] and have been extensively tested in different psychological experiments as information theory. Evidence indicates positive emotions promote cognitive responses, while negative emotional information inhibits cognitive responses [36]. Bagnall (2003) and Poria et al. have highlighted that cultural heritage sites offer a tourism experience that combines both emotions and cognition [37][38]. The correlation between emotions and tourism experiences is influenced by the entire process of the tourism experience and varies depending on the different types of tourism experiences [39][40]. Using location-based AR gaming technology during cultural heritage tourism can create positive emotional responses that encourage tourists to engage in immersive experiences and discover more about themselves [41]. Enjoyment, fulfillment, and emotion are critical factors that significantly influence technology. While research in the field of tourism marketing has recognized the significance of these factors in determining behavioral intention, there is a mixed relationship between them [42]. The travel experience elicits various emotions in response to external stimuli. To comprehend the emotional reactions to cultural heritage tourism, we must examine their possible nature when experienced through AR. There is no single emotional state associated with the entire travel experience.

3. Location-Based AR Games and Cultural Heritage Tourism Experience

The growth of culture-based tourism indicates a changing preference for quality in modern society and a growing particular demand for experiential markets. Heritage tourism results from broader social and economic trends, and the quality and value of tourism experiences are a concern for practitioners and researchers involved in cultural heritage planning, management, and research. The potential benefits of using AR to enhance the travel experience are emerging, and applications using different technologies (live streaming, 3D environments, and geolocation games) have been developed for a variety of purposes [43][44], such as AR building games [45], cultural heritage video games [46], adventure games [47], and severe gaming. Exploring and using mobile devices promotes teamwork and physical activity and creates positive attitudes [48]. According to most studies, the application of gamification and AR to cultural heritage sites mainly focuses on location-based games [49], which take place in natural locations such as historical sites, cultural objects, landmarks, etc., are positioned as points of interest during visits [50]. Haahr defines the game experience in cultural heritage sites as an intermediary experience that perceives the natural environment and further studies the type of immersive perception [51]. Research on AR applications in cultural heritage tourism usually emphasizes technology acceptance (in terms of presenting information) or pedagogical (transmission of information); insights from such studies suggest that visitors to cultural heritage sites place a high value on aesthetics, price value, accessibility, and personal innovativeness and engagement when using AR, often with some degree of positive visitor attitudes toward the technology [52]. Augmented reality environments contain content that guides the visitor's experience, and the value of using the technology is found during the experience. Tom Dieck and Jung, Chung [53][54] also focused on the same context,

finding that technology readiness, visual appeal, cost of use, and convenience affect tourists' adoption of new technology. In addition, Jung et al. [55] tested quality models to investigate visitor satisfaction and AR app recommendation intent. However, functional characteristics such as usefulness and ease of use alone have been considered insufficient [56], and Hassenzahl [57] emphasizes the importance of individual circumstances. From a visitor experience perspective, usability also includes perceptual and emotional aspects.

The concept of participation plays a central role in the study of cultural heritage tourism and visitors' behavior. Engagement is a feature that visitor–location-based AR game interactions share with other HCI environments, and the application of games is a key component in shaping visitor experience and behavior. As a positive technology that subjectivizes visitor experience, AR games at cultural heritage sites can induce satisfaction and pleasure [58], and participation comes from this positive experience [59]. In studies investigating the impact on user engagement and experience, it was found that control-based games, performing a character's physical tasks, or customizing a character's behavior enhances the fun and positively affects engagement [60]. Yan's research showed that the game experience was verified under the utility model of positional AR games, and the results were related to fulfillment, presence, and hedonism. Emotions are an essential part of how people experience the world. However, the impact of positive emotions on visitor experiences using location-based AR games and the role of positive emotions delivered through them remains to be empirically tested.

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