

# Virtual and Augmented Reality in Serious Tourism Games: Opportunities, Tourist Motives, and Challenges

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**Abstract.** Using prior models regarding online consumer behavior and adoption of technological innovations the present study aims at identifying various factors that might impact on tourists' intention to adopt mobile augmented reality gamified applications for tourism destinations and to decipher the impact of serious tourism games on tourists' perceptions and behaviors towards a destination. Based on a literature review the present study developed a conceptual model that considers important antecedents that could impact tourists' intention to adopt a mobile augmented reality gamified applications for a tourism destination. Moreover, tourists' responses to usage of serious tourism games were also identified. The hypothesized model suggests that tourists' intention to use augmented reality serious games for tourism could be influenced by environmental factors concerning the design of the application, the technical characteristics of the application as well as the features of smart mobile devices of users. Tourist characteristics related to personal traits and demographics, perceived benefits (enjoyment, ease of use and usefulness), and motivations (entertainment, knowledge, curiosity, exploration, immersion, escapism, physical activity, social interaction) were also found to be important antecedents of tourists' intentions towards mobile augmented reality serious tourism games. Furthermore, this study shed light on the impact of tourism gamified applications on tourist behavior. Analysis of prior studies indicates that tourists' usage of these applications can influence their perceived utilitarian and hedonic value and in turn result in increased levels of awareness, loyalty, word-of-mouth communication, and engagement of tourists with the destination. Results will help researchers test empirically the impact of the identified factors on tourists' usage intentions and subsequent responses. Moreover, practitioners and game developers could design user centered gamified applications that enhance tourists' satisfaction with the application and the destination as well.

## INTRODUCTION

The emergence of digital media and mobile technologies has led to the rapid development of "gamification" in the services [1] and tourism industry [2]. In 2011 the World Travel Market [3] predicted that gamification would be a major trend in the tourism industry. Moreover, during the last decade, "serious games" and the usage of game elements have attracted the attention of tourist providers [4].

Serious games or gamification [5,6] can be regarded as a type of persuasive technology that is related to a set of cognitive design elements which aim to change users' behavior [7]. [8] argue that serious games can enable users to achieve goals through an entertaining experience. According to [1] serious games employ a gaming mechanism in a non-gaming context trying to motivate users to complete certain tasks in a structured way following specific rules. The result of a serious game is users' engagement and interaction with the environment, other players, and service providers in order for players to earn rewards [9]. Serious games in tourism should be differentiated from traditional marketing loyalty and reward programs that aim to boost sales as serious games are designed to inform, entertain,

engage, and co-create the tourist product with visitors [10]. Thus, the essence of serious games in tourism is not only the completion of a game (with winners or losers) but also the experience provided [11].

The potential of serious games for tourism is enhanced due to the developments in virtual and augmented reality applications that can maximize the “presence” of visitors at tourism destinations [12]. Indeed, mobile serious games that employ augmented reality and location-based storytelling can be regarded as a new promotion channel for tourism destinations that will help tourism providers interact with visitors and create engaging tourism experiences [13, 14].

The importance of serious games for the tourism industry is associated with the provision of memorable and extraordinary experiences. In other words, serious games can be regarded as a differentiation basis for tourism destination that emphasizes innovation [11]. Therefore, a significant number of tourism organizations and services are utilizing serious games for purposes related to marketing, sales, and tourist engagement [9].

[10] indicate that serious games can contribute to the development of the tourism industry through the formulation of unique tourism experiences, enhancement of tourist engagement, co-creation of tourism experience with tourists, and improvement of destination awareness and tourist loyalty. Serious games along with social media and mobile technologies can also lead to positive word-of-mouth about the destination.

Despite the importance of augmented reality serious games for tourism destinations, research on serious games is still in its infancy with most of the related studies being descriptive in nature and presenting case studies of serious games [15]. To our knowledge only few studies examine tourists’ motivations for using tourism serious games [16, 17] and fewer have developed holistic conceptual models to map the factors that affect tourists’ intention to use mobile augmented reality gamified applications as well as the consequences of this usage on tourists’ behavior towards the destination. Towards this end, and using as points of departure prior models regarding the online consumer behavior and the adoption of technological innovation (Stimulus-Organism-Response model – SOR model, technology acceptance model – TAM model) we aim at identifying various factors that might impact on tourists’ intention to adopt mobile augmented reality gamified applications for tourism destinations and to decipher the impact of serious tourism games on tourists’ perceptions and behaviors towards a destination. Findings of the present study will help researchers test empirically the impact of the identified factors on tourists’ usage intentions and subsequent responses. Moreover, findings could serve as important inputs for practitioners and game developers to design user-centered gamified applications that enhance tourists’ satisfaction with the application and the destination as well.

## **FACTORS AFFECTING ADOPTION OF MOBILE GAMIFIED APPLICATIONS IN TOURISM**

Research on adoption of online shopping has suggested that consumer adoption of online shopping is influenced by four main factors namely, consumer characteristics that are related to personality traits and demographics; perceived values; the design of the application along with the products/service itself [18]. Hence, it can be argued that intention of tourists to adopt an augmented reality gamified application can be influenced by similar factors.

Tourist characteristics can influence the adoption intention of serious tourism games. [19] found that tourist innovativeness may be an important inhibitor of usage intention of tourism-related augmented reality games. Moreover, adoption of these games could be affected by consumers’ awareness of the gamified application as well as reluctance to use such applications [13]. As Garcia note, tourists might not be willing to download and use an application that have not heard before. Prior knowledge about and familiarity with tourism augmented reality games are other important antecedents of adoption intention that should be taken into consideration by game designers [8]. [20] found that tourists who played a gamified application experienced high levels of stress and anxiety when they confronted aspects in the game with which they were not familiar (e.g., quizzes) or they considered them difficult based on their knowledge. Moreover, tourists’ demographic characteristics (e.g., generation, gender) can influence the acceptance and adoption of gaming applications. [21] revealed that Millennials and Generation Z tourists are more inclined to engage in gaming geocaching activities. [22] and [23] point out that perceived risk, data security and physical safety need to be considered as possible factors that might affect intention to use mobile augmented reality games such as Pokemon Go. For example, tourists might avoid using applications that require the provision of personal data due to privacy concerns [24]. In addition, perceived physical risk is also associated with the adoption of tourism serious games. These games might put players’ safety in danger as they can distract their attention and cause accidents [11].

However, one should bear in mind that tourists’ attitudes towards the destination might also affect their decision to use a tourism related gamified application. As [25] argued, existing fans of Pokemon were more inclined to use the augmented reality Pokemon Go application.

The technology acceptance model (TAM) has been regarded as a fundamental model that can explain the factors that affect adoption of information technology innovation. Thus, the TAM model can be used to decipher the impact of perceived values on intention to use augmented reality gamified applications in tourism [24]. The study of [19] revealed that tourists will use a hotel-related gamified application based on the perceived enjoyment (the application brings the element of fun), ease of use (application is easy to understand and operate), and perceived usefulness (the application has some value).

Research on consumer behavior in online environments has also utilized the Stimulus-Organism-Response model of [25] to explore the antecedents of users' behavior. Stimulus is related to variables from the environment (e.g., product design) while organism is associated with consumers' perceptions and emotions. Response could take the form of purchase behavior, adoption, or avoidance. In a similar vein, [26] suggest that the SOR model can also be applied to explain consumers' adoption intentions of gamification. In their study, they suggest that users' might be influenced to adopt gamified applications based on the game design. This design is comprised of components that can be organized in three groups: game components (avatars, badges, virtual goods, points, and leaderboards), social components (achievements, collections, teams, gifting) and processes (levels, feedback, combats, content unlocking, rewards). In regards, to the game design, [16] have highlighted the crucial role of content for serious tourism games, that should include the right balance of informational and entertaining elements so as not to induce boredom to tourists. In a similar vein, [13] suggest that few tourists will continue to use a gamified application if the content and information provided about the destination are not easily accessible, add value, and tell an interesting story. In the context of augmented reality applications in urban heritage tourism, [27] found that several product features and characteristics can shape tourists' decision to use such applications. These features are related to (a) the content of the application, the level of personalized information, as well as information about the destination, and tourist reviews and ratings; (b) presentation of the content in terms of user interface, accuracy of GPS and authenticity in the design, (c) functionality which is related to the navigation features, filter information based on users' preferences, and usage of multiple languages, and (d) interactivity that is associated with accessibility and responsiveness of the application. Moreover, another design element that need to be taken into account is the control that users might have over the game as well as the time that needs to be dedicated to completing the game. According to [11] tourists need to be able to stop the game any time they desire.

Other studies have also stressed the importance of technical features related to the application itself as well as the smart mobile features of users. According to [27] users' desire a fast-working application with high quality graphics, video and audio quality. In terms of mobile characteristics, previous studies have shown that GPS accuracy, low camera and screen quality, low audio quality especially in high density streets, and low battery duration can be negative antecedents of tourists' intentions to use a gamified tourism application [11, 28].

## **MOTIVATIONS FOR USING SERIOUS TOURISM GAMES**

The success of gamified applications lies also in users' personal motivation to engage with the application [29]. [30] argue that both the player's internal and external motivations should be taken into account during the design of serious games. According to [9] internal motivations relate to the hedonic dimension of the consumption experience [31] and the emotional and affective outcomes that tourists expect to feel [32]. On the other hand, external motivations are associated with players need to achieve a certain performance and to yield specific tangible rewards [32]. As [16] note several serious games in the tourism industry have failed as they were designed without taking into consideration visitors' motives to engage in such games.

[33] suggested that motivations of players of online games can be organized in three main types such as (a) achievement that is associated with the feelings of progress, powers, status, and competition, (b) social motives that reflect players need to socialize with other players, to build relationships, and feel part of a team, and (c) feelings of immersion that are related to the sense of discovery, escapism, role-playing through the usage of elements such as specific appearances, accessories etc. [24] also revealed that for smart gaming applications, pleasure is the main motivation that affects tourists to use these applications combined with the feelings of interaction with other players.

[16] shed light on motives of tourists to use virtual and augmented reality applications through a qualitative study. Results indicated that tourists are motivated to play serious games for five main reasons, namely, curiosity, fun, exploration, socializing, and challenge and achievement. More specifically, curiosity refers to the perceived innovativeness of gamified applications that will lead tourists to play the game for the first time. Fun also emerged as a dominant motivation for using augmented reality gamified applications as most tourists indicated that they seek for

entertainment when using these applications. The need to explore the destination in a virtual way as well as to gather information was also mentioned as an important motive by tourists. Tourists were also more likely to play serious games if they could socialize with other tourists and local community members as well as experience a sense of personal challenge, achievement and competition.

[25] investigating motivations of college students to play POKEMON GO, an augmented reality game, found that players are mainly intrigued to play for the physical activity as well as the curiosity and socializing processes as users want to get involved with other players.

[17] using a qualitative laddering technique examined the main motivations of tourists of the Flims Laax Falera destination for playing a gamified application. Findings indicate that tourists are motivated by five main factors, namely achievement and progress; recognition and status; connectedness to others; and reminiscence and entertainment. Achievement and progress are related to the learning experience and the feelings of personal challenge and self-esteem that a serious tourism game might trigger through elements related to performance tracking. Another motivation was the feeling of social recognition and status that tourists seek to experience by showing off their performance to others and impressing others through the leaderboard feature. Social motives also influence tourists' intention to use gamified applications as they desire to socialize with others and feel part of a community. Reminiscence in the form of fantasy, immersion, and daydreaming motivated tourists to engage with the gamified application by using the story feature that enabled them to create a story of their activities.

In a similar vein, [19] shed light on motives that affect tourists for a hotel gamified application. These motives include enjoyment, socializing, exploration, achievement, competitiveness, challenge, and showing off. Tourists expect from a hotel gamified application to trigger their feelings of joy and to socialize them as well as to explore through the application the hotel and the service environment. Tourists also desire to achieve challenges, engage in competition, push their selves to complete tasks, get rewarded and collect points. Furthermore, the need of respondents to "show their achievements" through a leaderboard emerged as an important motivation that can enhance their social status.

[34] using a Q methodology segmented visitors of a gamified trip in regard to their motivations. Results indicate that visitors can be classified in six clusters: knowledge collectors (learning about destination and tourist areas), reward seekers (winning prizes, receiving discounts), explorers (interacting with other, having fun, achieving tasks and challenges), curiosity seekers (experiencing surprises), sensation seekers (feeling excitement) and flow experiences (immersing in the experience and escaping from everyday routine).

Based on the aforementioned studies, tourists could be motivated to play a gamified application based on desire for entertainment, knowledge, curiosity, exploration of the destination, immersion, escapism from everyday routine, physical activity, and social interaction with other players, significant other and local people. In addition, tourists may engage with a serious game in order to feel a sense of achievement and to enhance their social status and competitiveness.

## **TOURIST RESPONSES TO GAMIFIED APPLICATION FOR DESTINATIONS**

Serious games offer significant benefits to tourism destinations as well as to tourists before, during, and after the trip. According to [9] before the trip, serious games can provide potential tourists information about the destination, trigger their interest as well as their intentions to visit the destination. During the trip, location-based games can enrich visitor's experience at the site. Through design elements such as challenges, rewards, competition, storytelling, role-playing, fantasy, tourists can live a pleasant, personal and rewarding tourist experience that will lead to greater engagement and satisfaction with the destination. Moreover, the use of virtual and augmented reality along with 3D technologies can offer tourists unique encounters, as they can experience virtually and physically the destination [35, 36]. After the trip, serious games can induce tourists' loyalty through rewards and coupons as well as feelings of nostalgia by creating memorable experiences that tourists can share with their significant others [9].

### **Utilitarian value - Knowledge gains**

Serious games are attractive platforms that enable visitors to learn and acquire knowledge about sites of cultural and tourist interest [37, 38]. Augmented reality can enhance cognitive experiences of tourists [39] and visitors are actively motivated to enrich knowledge about the destination, thus they turn from passive information receivers to active actors [40].

Gamified tourist applications can also increase visitors' awareness of the tangible as well as the intangible cultural heritage of a destination [8]. Tangible heritage is related to the historical sites, buildings, documents, works of art, and other artifacts as well as to the natural environment (e.g., landscapes, flora and fauna) and the geological, paleontological and morphological characteristics of the destination. On the other hand, the intangible heritage includes the language, customs, religious beliefs, and norms of societies in various historical periods. Realistic representations of the physical environment, monuments, and buildings can be achieved through serious games which in a way engage actively tourists to increase their knowledge about the history of a destination by acquiring reliable and accurate historical and other information. Also, through the use of virtual and augmented reality, historical periods and events of the past such as battles, celebrations, etc. can be revived. At the same time, a holistic experience can be offered that includes sounds (e.g. language, traditional music) and aesthetic elements. Thus, visitors become active participants of the customs, habits and traditions of a destination. Therefore, serious games enrich the cognitive as well as the educational experience of people in the locality (city, environment, archaeological site, museum, etc.).

### **Hedonic value - entertainment**

Another important aspect of gamification of the tourist product is associated with the entertainment experience that offers to tourists. As serious games use fantasy elements, visitors are motivated to explore in a pleasurable way the area, the buildings and the touristic sites [9]. According to [11] serious games in tourism can lead to a joyful experience. For example, searching for a lost stone in a cave can be part of a visit to a site that will encourage visitors to pay attention to the details of the site in an entertaining way. Thus, feelings of pleasure and adrenaline rush might be induced. Augmented reality can also enrich the entertaining dimension of tourist experience [41, 42].

### **Implications for Tourist Behavior**

Researchers have pinpointed the importance of serious games in shaping visitors' perceptions and behavior. [39] have found that intentions of tourists to play a serious tourism game can influence their intentions to visit the destination. [13] also note that serious games in tourism can increase the time of stay of visitors at a destination.

[4] suggest that serious tourism game involve citizens in interactions between the tourists, the physical environment, and service providers. This interactivity can be enhanced through virtual tours, quizzes, and riddles about touristic sites [37]. Moreover, a set of gaming elements can trigger high levels of tourist engagement since players can experience feelings of flow and absorption [10]. According to [43, p. 474] is defined as "a psychological state incurred by interactive, co-creative, tourist experiences with a focal agent/object (people/attraction/activities/encounters) in focal travel experience relationships". As a result, an emotional bond between visitors and tourist destination is created [44].

[45] investigating travel agencies in Egypt revealed that adoption of serious games can have a positive impact on tourist engagement which in turn can enhance tourists' awareness of the destination as well as loyalty. Tourist loyalty is the result of the fulfillment of the psychological needs of tourists [46] and can in a way be influenced by gaming elements such as points, rewards, leaderboards, and competition [9].

Word-of-mouth communication and the creation of virtual communities between players can also be regarded as a significant consequence of serious tourism games [15]. Tourists-players provide information related to the destination to other players as well as potential tourists. In addition, the utilization of social media in tourism gamified applications can enable tourists to share their personal experience with their online friends and thus, create a buzz around them [32].

Serious games can be regarded as an important tool for marketers that can help them collect real information about the real behavior of tourists at a destination, which in turn can lead to the improvement of the offered service [13]. Through the use of appropriate gaming elements, it is possible to collect personal data and characteristics of players.

[47] presented an interactive gamified application for the Tripolis museum in Greece that was designed to induce visitors' awareness of the tourist product, word-of-mouth communication, and engagement in social media. This application was comprised of five mini games as follows:

- (1) Your face in a statue where tourists can take a photo of themselves and place it at the face of an ancient statue from the museum collection. This way visitors can create profile pictures for social media thus create awareness for the museum.

(2) Who is your guardian goddess? The second mini game is a mini quiz which in comprises of questions related to history, ancient Greece, and mythology. In the end of the game, visitors are informed about the goddess that fits their characteristics. As a result, a short profile of visitors can be assessed as players respond to personal questions.

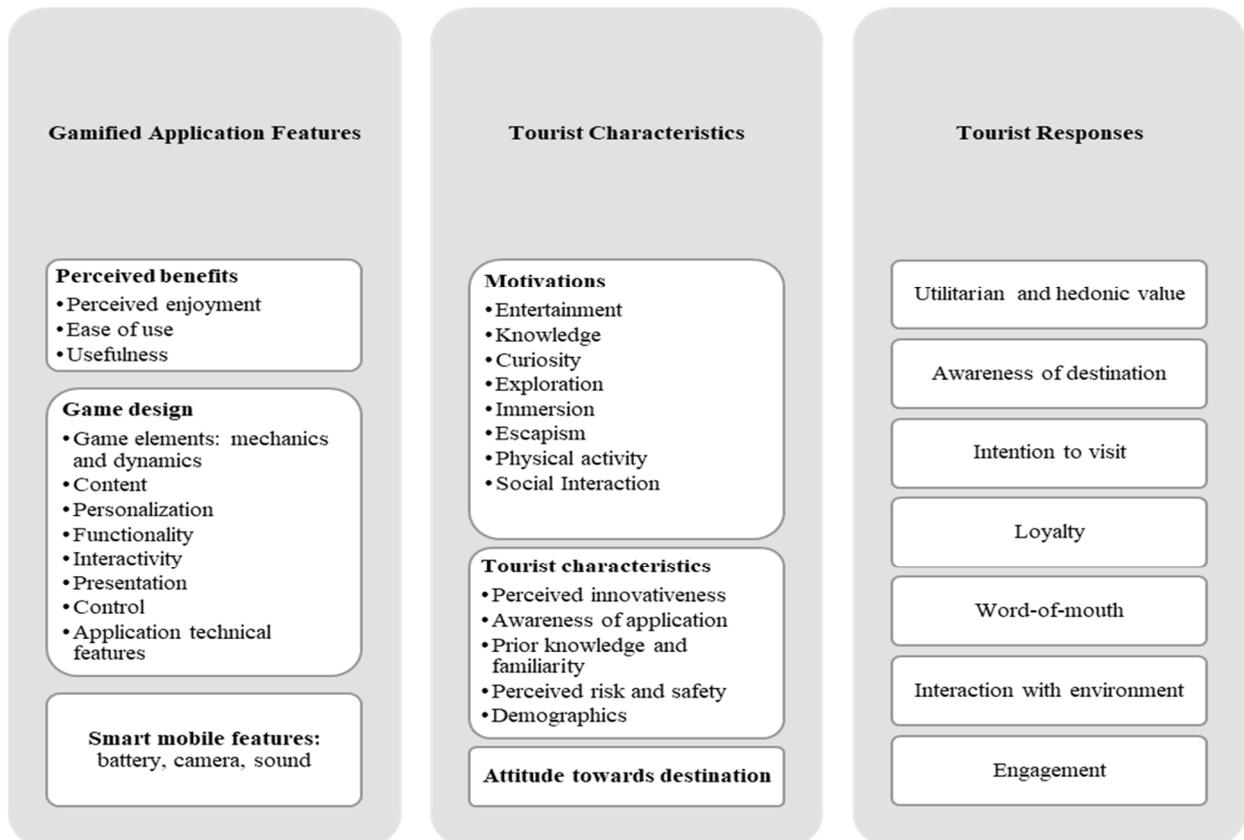
(3) Anthroponymy. The aim of this game is to reach the end of a maze by unlocking paths, solving anagrams related to archaeology in order to receive the etymology of your name. The sooner the player finds the words, the more points he/she will collect. Hence, the player's knowledge as well as feelings of adventure are enhanced.

(4) Your status in the ancient society is a mini-game consisting of mini-quizzes. These questions also help to outline the user's profile.

(5) Ancient fashion. The purpose of the game is to enhance the players' knowledge about fashion in the various cultures of ancient Greece. Specifically, players choose clothes from different eras and regions of ancient Greece and create new fashion styles. At the end of the game, they can take a photo of the attire they had prepared as memorabilia. Thus, word-of-mouth communication can be achieved as players can share their photos on social media.

### CONCLUSIONS: TOWARDS A HOLISTIC ADOPTION MODEL

Using various models (e.g., SOR, TAM) the present study sought to develop a conceptual model that considers important antecedents that could impact tourists' intention to adopt a mobile augmented reality gamified application for a tourism destination. Moreover, tourists' responses to usage of serious tourism games were also identified (Figure 1).



**FIGURE 1.** Conceptual model of antecedents and consequences of adoption of mobile augmented reality gamified application for tourism destinations

As demonstrated in this work, tourists' intention to use such games could be influenced by environmental factors concerning the design of the application (gaming elements, content, interactivity etc), the technical characteristics of

the application as well as the features of smart mobile devices of users. Consumer characteristics related to personal traits and demographics, perceived benefits (enjoyment, ease of use and usefulness), and motivations (entertainment, knowledge, curiosity, exploration, immersion, escapism, physical activity, social interaction) were also found to be important factors that impact tourists' intentions towards mobile augmented reality games for tourism related purposes. Furthermore, this study shed light on the impact of tourism gamified application on tourist behavior. Analysis of prior studies indicate that tourists' usage of these applications can influence their utilitarian and hedonic value received as well as result in increased levels of awareness, loyalty, word-of-mouth, and engagement of tourists with the destination.

It is herein suggested that future research could be directed on validating the hypothesized conceptual model empirically by investigating tourists' intentions and perceptions towards mobile augmented reality gamified applications for tourism destinations.

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