



Using gamification at cultural heritage sites to enhance visitor experience

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ABSTRACT

Title: Using gamification at cultural heritage sites to enhance visitor experience

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This study aims to develop an understanding of how gamification can be used to enhance visitor experience at cultural heritage sites. As technology evolves rapidly, Gamification, a concept first defined in terms of marketing in 2011, has emerged as an innovative tool to establish enhanced experiences by creating more engaging and interactive activities and exhibitions for visitors. While gamification is widely studied in various applications in marketing and sales, its role in cultural heritage tourism remains underexplored. To address this gap, we conducted a quantitative study through an online questionnaire targeted at individuals who visit or have visited cultural heritage sites. The purpose of the study was to understand which factors contribute to the adoption of gamification and its impact on visitor experience at a cultural heritage site. We draw on the Uses and Gratifications (U&G) and Technology Acceptance Model (TAM) frameworks to analyze the adoption criteria of gamification and its subsequent effects.

The findings of our study indicated that these models provide good predictive power for the willingness to adopt gamification. Specifically, our results showed that the digital savviness of an individual plays a significant role in the adoption intention. Moreover, the results demonstrate that gamification plays a mediating role in enhancing the visitor experience through factors such as perceived ease of use and entertainment gratification.

These findings underscore the potential of gamification to transform cultural heritage tourism by fostering deeper engagement and satisfaction among visitors, offering valuable insights for managers and other stakeholders in the tourism industry.

Keywords: Gamification, visitor experience, cultural heritage tourism, Uses and Gratifications, Technology Acceptance Model, tourism management

SUMÁRIO

Título: Utilizar a gamificação em sítios do património cultural para melhorar a experiência do visitante

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Este estudo visa compreender como a gamificação pode ser utilizada para melhorar a experiência dos visitantes em locais de património cultural. Com a rápida evolução tecnológica, a gamificação surgiu como uma ferramenta inovadora para estabelecer experiências melhoradas para os visitantes através da criação de actividades mais envolventes e interactivas. Embora a utilização da gamificação tenha sido amplamente estudada na área do marketing e vendas, o seu papel no turismo do património cultural tem sido pouco explorado.

Para colmatar esta lacuna, procedemos a um estudo quantitativo através de um questionário online dirigido a indivíduos que visitam locais de património cultural. O objetivo foi compreender quais os factores que contribuem para a adoção da gamificação e seu impacto na experiência dos visitantes. Baseámo-nos nas teorias dos Usos e Gratificações e Modelo de Aceitação de Tecnologia para analisar os factores influenciadores da adoção da gamificação e seus efeitos subsequentes.

Conclusões do nosso estudo indicaram que estes modelos fornecem um bom poder de previsão sobre a intenção de adoptar a gamificação. Especificamente, concluímos que o know-how digital desempenha um papel significativo na intenção de adopção. Além disso, os resultados demonstram que a utilização da gamificação desempenha um papel mediador na melhoria da experiência do visitante através de factores como a facilidade de utilização e a gratificação do entretenimento.

Estes resultados sublinham o potencial da gamificação para transformar o turismo do património cultural, promovendo um maior envolvimento e satisfação dos visitantes, oferecendo informações valiosas para os gestores e outras partes interessadas na indústria do turismo.

Palavras-chave: Gamificação, experiência do visitante, turismo de património cultural, Usos e Gratificações, Modelo de Aceitação de Tecnologia, gestão do turismo

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GLOSSARY

Gamification – The application of typical elements of game playing (e.g. point scoring, competition with others, rules of play) to other areas of activity, typically as an online marketing technique to encourage engagement with a product or service

Serious games – Serious games are defined as “any form of interactive computer-based game software for one or multiple players to be used on any platform and that has been developed with the intention to be more than entertainment.

Sustainable tourism – A concept that covers the complete tourism experience, including concern for economic, social, and environmental issues as well as attention to improving tourists' experiences and addressing the needs of host communities.

Heritage tourism – A branch of tourism centered around the exploration and appreciation of a region's cultural, historical, and environmental heritage.

Destination applications – Destination apps are specific media channels designed to communicate the unique characteristics of a destination and influence visitors' perceptions of the place.

Destination Management Organization (DMO) – A destination management organization that promotes and drives a community's economic development by increasing travel and tourism in the region.

1. INTRODUCTION

1.1. Background and Problem Statement

Gamification is a rising topic in today's day and age. When talking about gamification, we are not referring to games such as Super Mario Bros but rather the concept defined as "the use of game design elements within non-game contexts" (Deterding et al., 2011). Since 2011, there has been a steady increase in the amount of research articles published related to persuasive technologies such as gamification (Hamari et al., 2014). Aside from academic research, gamification has become a prevalent player in many different fields and industries (Deterding et al., 2011). Today, the global gamification market is projected to grow to the size of US \$116.68 billion by 2032 (Precedence Research, 2023), making this a significant topic to discover and explore. The main drivers behind this steep increase are the integration of emerging technologies such as AI, as well as the implementation of customer-centric business models which are more common today (Technavio, 2024).

In the tourism industry, gamification is a tool frequently used by destination management organizations (DMOs), service providers, and many other players to create engagement and improved experiences for visitors (Swacha & Ittermann, 2017). Some good examples of gamified applications have been implemented in Regensburg Germany (Walz & Ballagas, 2007), Shaanxi in China (Gao & Wu, 2017), and in Indonesia (Widarti & Emanuel, 2020). Although gamification has become common in several industries such as education and retail (Buhalis & Sinarta, 2019; Pasca et al., 2021), there is still a gap in existing research when it comes to the tourism industry and the adoption of such technologies by visitors (Huotari & Hamari, 2017).

Malik et al. (2024) have combined two theories to study why visitors would adopt gamification initiatives offered by online travel agencies. These theories were the Uses and Gratifications (U&G) theory (Katz et al., 1973) and the Technology Acceptance Model (TAM) (Davis, 1989). This study provides a basis and theoretical background for our research as we believe these models are suitable to explore the adoption of gamification by visitors at cultural heritage sites (instead of online initiatives).

1.2. Problem Statement

Our study aims to assess if gamification can enhance the visitor experience at cultural heritage sites. Visitor experience is a crucial yet difficult element to study and measure for Destination Management Organizations (DMOs). The experience of visitors depends on a variety of different factors which cannot all be influenced by managers and organizations (Swacha & Ittermann, 2017). By utilizing the TAM and the U&G theories as theoretical framework, as previously done in other studies (Malik et al., 2024), our study analyzes how visitors' experience can be enhanced to a certain extent through the means of gamification tools.

Having said that, the following research questions and objectives were defined:

Research Question 1: To what extent has gamification been studied and implemented in the tourism industry?

Research objective: Understand how and where gamified elements have been implemented and how they have been documented in the academic literature before.

Research Question 2: How does the use of gamification influence visitors' experience at cultural heritage sites?

Research objective: To assess the impact of gamification features on visitors' level of overall experience when visiting cultural heritage sites.

Research Question 3: What are the key factors to the adoption of gamification that influence the visitor's experience at cultural heritage sites?

Research Objective: To identify and analyze the specific factors that influence the use of gamification (e.g., ease of use, entertainment, etc.) that ultimately lead to a better visitor experience.

Research Question 4: Does the use of gamification differ in its effectiveness based on visitor demographics such as digital savviness?

Research Objective: To analyze whether the success and appeal of gamification strategies vary across different visitor demographics, providing recommendations for tailored gamification approaches that meet the needs of diverse visitor groups.

1.3. Relevance

As stated earlier, we identified an existing gap in the literature regarding the sectors in which gamification has been studied. Specifically, gamification has not been much researched within some service marketing sectors like tourism (Huotari & Hamari, 2017). Moreover, while gamification has grown into a multi-disciplinary field, much of the research has focused on short-term effects, leaving gaps in the understanding of the long-term benefits, psychological mediators, and behavioral outcomes of gamification initiatives (Nacke & Deterding, 2017). This thesis aims to bridge part of that gap by examining the impact of gamified efforts in tourism, a sector where experiential marketing is often employed to enhance visitor experiences (Pine & Gilmore, 1998).

Experiential marketing in tourism allows destinations to create memorable experiences, and integrating gamification within these strategies could further boost visitor engagement. , Based on a theoretical framework that combines constructs from the TAM and the U&G Theory, this research will explore how five key independent variables: perceived ease of use, perceived usefulness, entertainment gratification, information-seeking gratification, and digital savviness, affect the use and adoption of gamification in tourism and subsequent impact on visitor's experience. From a practical perspective, understanding how these factors influence gamification can offer managers actionable insights into enhancing visitor engagement, fostering positive word-of-mouth, and improving the destination's overall image (la Cuadra et al., 2020). Specifically, it may provide destination managers and DMOs with valuable tools to help them understand how to leverage gamified applications to enhance visitors' experience, improve engagement and sustain cultural heritage. In addition, it contributes to academic literature by expanding academic understanding of gamification in tourism and by proposing and testing a new theoretical model that integrates variables from the TAM and the U&G Theory in a totally new approach.

In summary, this dissertation contributes with both academic insights and practical recommendations for managers seeking to enhance visitor experiences through gamified strategies.

1.4. Dissertation Outline

This dissertation comprises seven chapters structured the following way:

Chapter 1 introduces the dissertation topic of gamification and defines the outline for the research. This chapter aims to contextualize the topic and define the scope of the dissertation. Namely, it highlights the research questions and objectives, as well as the relevance of the topic from both a practical and theoretical perspective.

Chapter 2 summarizes the existing body of literature related to gamification in general but will also take a closer look at gamification in tourism and existing frameworks that have been developed so far. Relevant prior research is summarized and discussed in chapter 2 providing a theoretical framework for our research and ensuring that prior studies' limitations and findings are considered.

Chapter 3 comprehensively details the research methodology that has been followed in our empirical study. In this chapter we justify why the chosen methodologies are relevant and generate valid and valuable results for the conclusions. Additionally, this chapter addresses the data analysis techniques that we used, as well as sampling, validity, and reliability questions.

Chapter 4 outlines the findings based on the data gathered through our empirical study.

Chapter 5 builds on the results from chapter 4 to discuss them and provide the conclusions that can be drawn from the data.

Chapter 6 will close the dissertation and the research project by highlighting the key takeaways from a managerial and theoretical perspective. emphasizing the limitations of the dissertation and potential directions for future research.

2. LITERATURE REVIEW

2.1. Cultural Heritage Tourism

2.1.1 Definition and Importance

In 2024, the global cultural tourism market was estimated to account for over 39% of all international tourist arrivals, which is equivalent to around 516 million international trips (Grandview Research, 2024). Cultural tourism on a general level refers to travel with the intention or motivation to get to know, experience, and learn about the culture of a country or region (Ardelean & Badulescu, 2022). According to UNWTO (2018), the over-arching term of cultural tourism can be subdivided into multiple categories such as (in-) tangible heritage tourism, city breaks, culinary tourism, community tourism, and religious/ spiritual tourism, each sub-category having its own characteristics. This thesis will focus on cultural heritage tourism.

Heritage tourism can be defined as the motivation to experience various items, representative of past and present periods, at a tourist destination (Adongo et al., 2017). This type of tourism, which includes an interest in cultural heritage, has also been defined as the act of traveling to a location to learn and discover more about the historical value of that place which it inherited from the past and its ancestors (Kidi et al., 2017). Cultural heritage can be divided into two types: tangible assets which include buildings, structures, and ruins, and intangible assets. UNESCO (1972) defines intangible cultural heritage as the practices, representations, expressions, and knowledge that a country or region recognizes as part of its cultural heritage.

2.1.2 Trends and Challenges

Although rising in popularity, heritage tourism brings about many concerns about the sustainability and authenticity of tangible and intangible heritage. Loulanskia & Loulanski (2011) identified 15 factors that are critical to the sustainable development of heritage tourism, such as education, local involvement, and sustainability-centered tourism development. The concern for the sustainable development of heritage tourism as well as the rise of smart tourism where new technologies are being introduced to cultural tourists have increasingly been studied in past literature but have yet to be thoroughly explored together (Richards, 2018).

A few of these trends and new developments in technology are described by Espeso-Molinero (2023). The author highlights that through the integration of these new technologies such as QR

codes, virtual and augmented reality, and the Internet of Things, tourism destinations will be able to enhance the interpretation of the elements available at the sites by providing immersive and dynamic narratives. These technologies are then integrated by the tourism organization to develop smart tourism destinations that utilize the data collected through initiatives to enhance visitor experience and satisfaction (Faur & Ban, 2021). Specifically at cultural heritage sites, a few key emerging technologies such as digital content, simulations and recreations, and digital libraries are used to preserve the heritage site while also educating the visitors on the cultural heritage present at this destination (Todorova-Ekmekci, 2021).

2.1.3 Gamification in Cultural Heritage Tourism

Gamification in cultural heritage tourism has emerged as an effective approach to enhance visitor engagement and learning. By applying game design elements to non-game contexts, gamification can create immersive and memorable experiences that foster a stronger connection with cultural heritage (Casillo et al., 2023). This approach particularly benefits younger audiences and can address challenges in disseminating tangible and intangible cultural heritage. Immersive technologies like augmented and virtual reality, combined with interactive narratives and personalized experiences, can significantly enhance visitors' understanding of historical and cultural significance (H Wang et al., 2024).

Gamification has emerged as a significant tool in promoting cultural heritage and tourism. While it can enhance the knowledge gained about cultural sites, its effects on psychological outcomes like enjoyment and loyalty are not always positive (B. C. Lee, 2019). Cultural institutions increasingly view serious games as strategic digital marketing tools for heritage promotion, with successful examples like the Etruscan-themed game "Mi Rasna" in Italy (Bonacini & Giaccone, 2022). Applying gamification in cultural heritage aims to change attitudes and behaviors towards heritage sites. Recent trends in this field focus on enhancing user experience through interpretation and presentation approaches (Karahan & Gül, 2021). By leveraging gamification, cultural heritage sites can amplify engagement, encourage active participation, and create memorable experiences tailored to diverse audiences. However, the effectiveness of gamification in cultural heritage contexts remains complex, with both positive and negative outcomes observed in different aspects of the visitor experience (Karahan & Gül, 2021; B. C. Lee, 2019). In the following subsections, we will explore the topic of gamification further.

2.2. Experiential Marketing

2.2.1 Experiential Marketing in Tourism

In 1998, Pine & Gilmore identified a new category beyond commodities, goods, and services that could be sold: experiences. The authors mentioned that experiences could be sold to consumers, and they illustrated this with the example of Disney parks, which go beyond offering simple attractions such as rollercoasters. Instead, the parks create an immersive atmosphere with themed music, decorations, and actors dressed as beloved characters to enhance the overall experience, ensuring each visitor experiences a personalized journey. This approach highlights the unique characteristics of experiences; they are hyper-personal and vary from person to person, making them memorable and impactful (Pine & Gilmore, 1998).

Building on this concept, Schmitt (1999) introduced the term “experiential marketing.” He defined the concept as marketing where consumers are viewed as rational and emotional beings who are concerned with achieving pleasurable experiences. Schmitt (1999) proposed a framework that includes five different types of experiences that marketers can use to create memorable experiences for customers: sensory experiences (sense), affective experiences (feel), creative cognitive experiences (think), behaviors and lifestyles (act), and social identity experiences that result from relating to a reference group or culture (relate). These five factors, or strategic experiential modules (SEMs) are crucial to developing a successful experience for consumers. They are particularly relevant in the tourism sector, where creating immersive and memorable experiences is critical to attracting and retaining visitors.

In the context of cultural heritage tourism, experiential marketing has become a cornerstone for engaging visitors. By focusing on multisensory and emotional connections, destinations can craft unique experiences that resonate deeply with tourists, enhancing satisfaction and loyalty. For example, cultural heritage sites often use storytelling, recreation and interactive exhibits to immerse visitors in the history and significance of the site. This not only enhances the educational aspect but also strengthens the emotional and social bonds visitors develop with the destination.

As experiential marketing evolves, the integration of digital technologies has opened new avenues for enhancing visitor engagement. Gamification, a tool that incorporates game-like elements into non-gaming contexts, has emerged as a natural extension of experiential marketing in tourism.

2.2.2 Gamification as Part of Experiential Marketing

Early research identified that when people participate in game-related activities, they become more playful (Csikszentmihalyi, 1975). Later studies have built onto this concept and found that those who are experiencing a 'playful' state show an increased interest in exploring new things, such as novel technologies, as the playfulness state stimulates flexibility and spontaneity (Hoffman & Novak, 2009). These findings have led to more research being conducted on the use of games in different contexts and ultimately led to the development of gamification. Deterding et al. (2011) have proposed the definition of gamification as "the use of game design elements in non-game contexts". Additionally, they have made a clear distinction between gamification and serious games. Serious games are those where fully developed games are used in a non-game context whereas gamification is the use of gamified elements, not a fully developed game (Deterding et al., 2011).

The origins of gamification in Marketing lie in customer loyalty and reward programs where customers can collect points to redeem for discounts or products (Pasca et al., 2021). Gamification is an innovative marketing tool that can be used in the three stages of a tourist visit (pre, during, and after the visit) to enhance the tourists' experience throughout the process (Wei et al., 2023). Over time, gamification has grown from being a subtopic in innovation-related research to becoming a key topic in marketing and management (Procopie et al., 2015).

2.2.3 Gamification in Tourism

Gamification in tourism has many different shapes. Xu et al. (2013) identified a few of these formats such as location-based games. These types of games should encourage tourists to interact with the location through augmented reality. DMOs and other destination managers use these types of apps to attract more visitors and create unique experiences for them at the destination. Other studies have indicated that gamification could be used to enhance the ability to explore historical sites and tackle sustainability concerns (Buhalis & Sinarta, 2019). When people are on holiday as tourists, they tend to be more relaxed and negligent than at home. It is therefore harder to convince them to make sustainable and ecologically responsible choices, even when they do not consciously make these choices (Negruşa et al., 2015). The authors found that, by using gamification in an app, they were able to successfully encourage tourists to be more mindful of their environment and spark their interest in locally produced products. According to Widarti & Emanuel (2020),

gamified delivery of information and education to the visitor should be based on four main variables to increase effectiveness, namely usefulness, ease of use, ease of learning, and satisfaction. These four elements have been proven to generate positive results when used in gamified heritage tourism applied to temples (Widarti & Emanuel, 2020). According to Abou-Shouk & Soliman (2021), gamification has been used by travel agencies and DMOs to enhance the visitor's experience with the key factors to consider being ease of use, social influence and the facilitating conditions that exist (Abou-Shouk & Soliman, 2021).

Furthermore, other studies (Frías-Jamilena et al., 2022; Gao & Wu, 2017; Negruşa et al., 2015), have shown that gamified efforts generate positive social impacts (Frías-Jamilena et al., 2022; Gao & Wu, 2017; Negruşa et al., 2015). For example, as a result of the facilities created for tourists, the local ICT infrastructure might also be improved, benefiting the residents (Gössling, 2021). Moreover, the effective education of the local environment through gamification leads to a less harmful impact of tourists on the local ecosystem according to Negruşa et al. (2015). Finally, gamification can create benefits for local businesses that can see an increase in economic activity, while also becoming more technologically enabled (Skinner et al., 2018).

In the last decades, various technologies have been used and are being implemented in the tourism industry with the most recent being 3D digital technologies, AR/VR, gamification, and IoT platform configurations (Mendoza et al., 2023). These technologies are meant to preserve both tangible and intangible heritage elements and are part of smart cultural heritage management. While we have seen many impactful technological innovations over the last few decades, the rise of the smartphone is arguably the most significant one (Gössling, 2021). With the increasing spread of functionalities that are integrated into mobile devices, tourism destinations can make use of destination-specific applications to enhance the travelers' experience before, during, and after the visit (Aramendia-Muneta, 2012). While these apps are often very static, research has shown that it would be much more effective in adding value for the visitor if these apps had social media integration and a higher level of interactivity (Benedek & Szöllösi, 2023).

Gamification can boost data collection, customer loyalty, brand awareness, user-generated content, and online engagement in tourism marketing (Sever et al., 2015). According to Xu et al. (2016), tourists' motivation to play games is multidimensional, starting with purposive information seeking and progressing to intrinsic stimulation and socialization. As the tourism industry becomes

increasingly competitive, gamification offers a promising strategy for destinations to create memorable experiences and stand out in the global market (Alčaković et al., 2017).

One recent study analyzes how the TAM (technology acceptance model) can be used to study the intention to use gamification technology by visitors (Malik et al., 2024). The TAM model consists of two primary factors that influence users' decisions: Perceived Usefulness (PU) and Perceived Ease of Use (PEOU). The authors integrated the TAM to analyze the adoption of gamified tourism marketing activities, and their findings align with the core principles of this model. Based on the findings of this study, the following hypotheses were developed:

H1: Perceived ease of use has a positive impact on the use of gamification

H2: Perceived usefulness has a positive impact on the use of gamification

That same study also explores the uses and gratifications (U&G) model as a second framework to understand why people would adopt gamification features offered by online travel agencies. One of the key features of the U&G framework is that it examines areas related to motivations, gratifications, and expectancy (Luo & Remus, 2014). In the past, researchers who have used this model have identified underlying dimensions for technology usage motivations (Luo & Remus, 2014). Using the U&G model in combination with the TAM model allows for a more thorough understanding of why consumers adopt new technologies and permit each model to counter the others' limitations (Florenthal, 2019). As a result of these findings, the following hypotheses were developed:

H3: Entertainment gratification positively impacts the use of gamification

H4: Information-seeking gratification positively impacts the use of gamification

2.3.4 Digital Savviness and the Adoption of Gamification

Digital savviness, defined as an individual's ability to effectively navigate, understand, and utilize digital tools, has become a critical determinant of technology adoption across various domains (Deursen et al., 2014). This concept extends beyond basic technological proficiency to encompass a readiness and openness to adopt emerging technologies, including gamification applications. Studies show that digitally savvy individuals are more likely to explore and engage with innovative tools due to their familiarity with digital environments and their confidence in leveraging these

tools for personal benefit (Bennett et al., 2008). Recent research (Bennett & Corrin, 2019) reveals significant diversity in people's technology skills and interests. Namely, factors such as age, gender, socio-economic background, and field of study may influence technology use, though findings are not consistent across all studies (Bennett & Corrin, 2019).

In the context of tourism, digital savviness significantly influences how consumers interact with technology-driven experiences. For instance, research indicates that tourists who are comfortable using digital applications tend to adopt tools like augmented reality apps, virtual tours, and gamified platforms at a higher rate than those with lower levels of digital literacy (Tussyadiah et al., 2018). These individuals view gamified technologies not only as functional tools but also as sources of entertainment and engagement, making them more likely to integrate such solutions into their travel experiences.

Furthermore, digital savviness enhances perceptions of ease of use and usefulness—key factors identified by the Technology Acceptance Model (Davis, 1989) as drivers of technology adoption. When applied to gamification in tourism, digitally savvy users are more inclined to perceive gamified elements as intuitive and valuable, leading to increased engagement and adoption. For example, gamification features such as interactive maps, leaderboards, and reward systems resonate more strongly with users who are adept at navigating similar interfaces in other digital contexts (Hamari & Koivisto, 2015). Based on what was previously said, we hypothesize:

H5: Consumers' digital savviness positively influences the use of gamification in tourism

2.3. Visitor Experience

2.3.1 Frameworks and Measurement

As defined earlier, tourism is more than just a visit to a location, it is about the experience. However, measuring visitor experience can be challenging as this is subjective to the individual's experience and perception. Several studies have aimed to develop a framework or methodology to study one's experience and how this can be influenced. The Museum Experience Scale (MES) and Multimedia Guide Scale (MGS) have been developed to quantify visitor engagement, learning, and emotional connection in museums, with multimedia guides shown to increase engagement (Othman et al., 2011). Another study conducted by Jorgenson et al. (2019) developed the TAMS model (Tourism Autobiographical Memory Scale). The authors find that we can study visitor

experience by looking at the emotions a previous visitor experienced and how impactful the memory of their visit was. By understanding if the experience they had caused strong enough emotions to create a long-lasting memory and whether this memory has had a significant impact on the visitor's life, we can establish whether they had a positive or negative experience.

Another method used to assess visitor experience is by looking at the behavioral intent of the person. Ardelean & Badulescu (2022), have identified a positive correlation between one's satisfaction and perceived value on behavioral intent. They argue that ensuring visitors' satisfaction and perceived value at a heritage site will most likely lead to positive behavioral intentions which include optimistic word-of-mouth and revisits to the heritage location or attraction. Rather (2020) developed a study that indicated that cognitive, affective, and behavioral customer engagement leads to better customer experience which, in turn, leads to positive behavioral intention. In other words, by engaging the customers mentally, emotionally, and practically, the customer experience will be enhanced and therefore will lead to positive recommendations for others and higher loyalty from the customers. These findings are like the ones observed by Ardelean & Badulescu (2022) which indicate that behavioral intent is seen as a good measure of visitor experience.

These diverse approaches provide valuable tools for researchers and managers to better understand and enhance visitor experiences across various contexts.

2.3.2 Gamification for Improved Visitor Experience

Studies show that gamification can positively impact user engagement and motivation. In e-learning environments, gamification acceptance is influenced by users' digital skill levels, affecting perceived usefulness and ease of use (Panagiotarou et al., 2020). In the banking sector, gamification elements like badges and levels can encourage millennials to save money (Rimenda et al., 2022). Social media gamification websites benefit from incorporating intrinsic motivation elements like enjoyment and playfulness into technology acceptance models (Aydin, 2015). Overall, these studies suggest that gamification can be an effective tool for increasing user engagement and motivation across various domains when implemented thoughtfully.

Gamification has emerged as a promising approach to enhance visitor experiences in cultural sites and tourist attractions. Research suggests that gamification techniques can also be applied throughout the visiting process, including before, during, and after the visit, to improve

engagement and interest (Swacha & Ittermann, 2017). Museums and cultural institutions are increasingly adopting gamification to attract and interact with visitors, competing with alternative leisure activities (Çetin & Erbay, 2021). Augmented reality (AR) treasure hunts have been proposed as a potential gamification strategy to enhance visitor experiences in cultural heritage sites (Sarker et al., 2022). A study on zoo visitors found that gamification could intensify the relationship between experiential modules, emotions, and visitor behaviors, potentially improving engagement for those seeking enhanced experiences (la Cuadra et al., 2020). Garcia et al. (2017) hypothesized and confirmed that the use of a gamification app would positively enhance the visitors' experience. Overall, gamification offers promising opportunities for cultural institutions to create unique, memorable experiences and differentiate themselves from competitors. We therefore formulate the following hypothesis:

H6: The use of gamification has a positive impact on the visitor's experience (at cultural heritage sites)

3. METHODOLOGY

In this chapter, the methodology used to gather primary data, as well as the sampling techniques will be described. An overview of the data analysis techniques and a contextual framework will also be provided. To visualize the hypotheses that were defined in Chapter 2, the following conceptual model was developed to illustrate the relationships between the various variables:

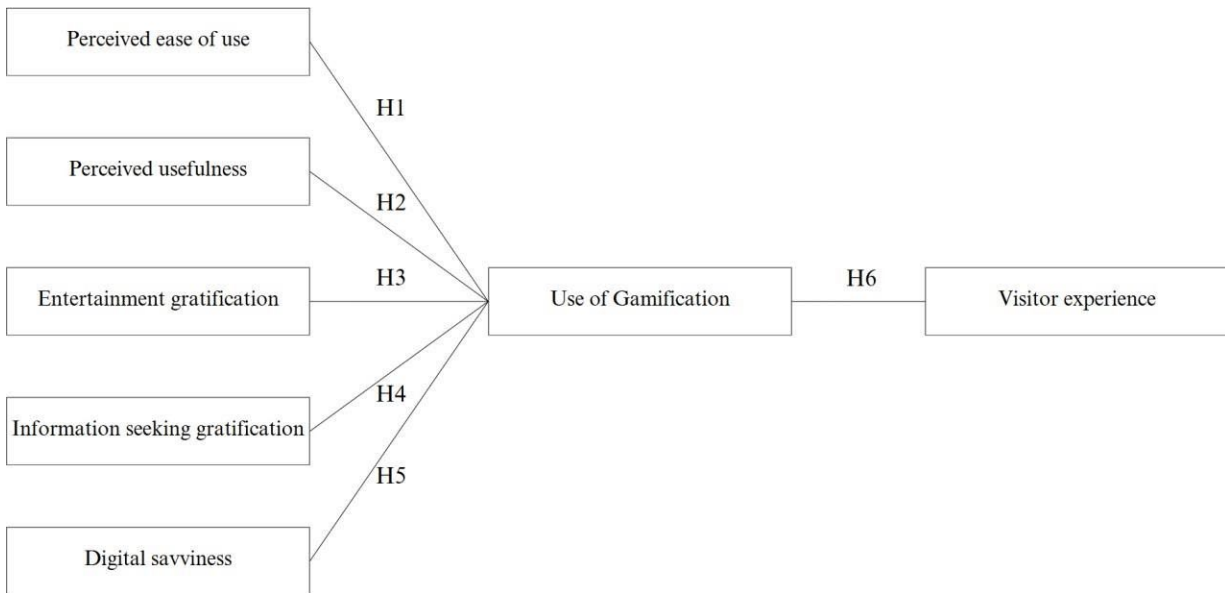


Figure 1: Conceptual model of the hypotheses

3.1. Procedure

This thesis aims to understand if the use of gamification can help enhance the visitor experience at cultural heritage sites. To study this topic, both primary and secondary data were used and collected. Secondary data mainly contributed to building a comprehensive literature review in chapter 2 that allowed for the development of educated hypotheses and research questions. The existing body of literature provided insights into experiential marketing and gamification, cultural heritage tourism, and visitor experience. The secondary data was collected through academic articles, books, and web articles using software such as Scopus and Google Scholar to build an extensive literature review. Primary data has been collected through a survey which generated quantitative insights and results. The purpose of using primary data is to validate the existing research while also building knowledge on top. The data collected in this thesis is quantitative by utilizing an online survey to gather responses.

3.2. Sampling

To collect quantitative data, the sampling technique used was convenience sampling. This non-probability method of sampling allows for quick responses to be collected and is also inexpensive. Both factors were important due to the time constraints of this dissertation. As a result of this method, 5 responses were collected during a pre-test survey and 331 responses were gathered during the actual survey. In the end, the final number of valid responses was 281. Although the topic of this study has a broad outreach, we decided to use one segmentation characteristic to ensure the responses were valid and useful. To participate in the survey, respondents were asked if they had visited a cultural heritage site in the past 2 years. If they had not, they were thanked for their participation and the survey ended. Throughout the survey, definitions and images were used to clarify potential doubts and insecurities which allowed for a reduced participation bias.

3.3. Data Collection

An online survey was used to collect primary data to understand the perceptions of tourists towards gamification, and whether the introduction of gamification at a cultural heritage site would enhance their visiting experience.

The survey was created using Qualtrics and was analyzed using IBM SPSS Statistics 30.0.0. The survey was spread using Facebook groups dedicated to tourism and was also sent to a third-party survey distribution platform, Prolific, to get a wider reach. The questionnaire is available in *Appendix 1*. The online questionnaire was launched online on November 15th and was spread to the audience until November 19th. After closing, a total of 331 answers were collected.

The questionnaire was divided into nine groups of questions related to the measurement of each of the model's variables. This allowed for a simplified analysis and clear division of the concepts for the participants. The first section contained 2 screening questions to determine the right sample for the study and a demonstration video to ensure all participants understood what a gamification app is. The next seven sections were each based on one variable. This meant that section two was about perceived ease of use, section three was about perceived usefulness, and so forth. The final section included three demographic questions to characterize better the sample we collected throughout the distribution.

3.3.1 Online Survey

Measurement and Indicators

Our conceptual model includes five independent variables (Perceived Usefulness, Perceived Ease of Use, Entertainment Gratification, Information Seeking Gratification, and Digital Savviness), one mediating variable (Use of Gamification), and one independent variable (Visitor Experience). Perceived Ease of Use (PEOU) and Perceived Usefulness (PU) are measured using the Technology Acceptance Model (TAM) constructs, where PEOU assesses the ease with which visitors can interact with gamification technologies, and PU gauges the perceived benefits of gamification in enhancing the visitor experience. Entertainment Gratification (EG) and Information Seeking Gratification (ISG) are derived from the U&G model proposed by Malik et al. (2024).

The dependent variables in this model are the Use of Gamification and Visitor Experience. The use of Gamification reflects the degree to which visitors use and engage with gamified elements during their visit. Visitor Experience encompasses overall visitor satisfaction and engagement, which includes cognitive, affective, and behavioral aspects.

Additionally, the Use of Gamification serves as a mediating variable, linking the adoption of gamification to positive behavioral intentions.

Together, these constructs create a comprehensive framework for examining which factors affect visitors' intention to use gamification and, subsequently, how the use of gamification affects visitors' experience.

Variable	Scale	Cronbach's Alpha	Author	Items
Perceived Ease of Use	5-point Likert Scale	0.92	(Malik et al., 2024)	3
Perceived Usefulness	5-point Likert Scale	0.992 0.916	(Wu & Chen, 2017) (T. T. Kim et al., 2010)	3
Entertainment Gratification	5-point Likert Scale	0.92	(Malik et al., 2024)	3
Information Seeking Gratification	5-point Likert Scale	0.88 0.91	(C. S. Lee et al., 2010) (M. J. Kim et al., 2020)	4
Digital Savviness	5-point Likert Scale	0.91	(Deursen et al., 2014)	4
Use of Gamification	5-point Likert Scale	0.95	(Turan et al., 2022)	3

		0.715	(Rodrigues et al., 2016)	
Visitor Experience	5-point Likert Scale	0.781 N/A	(Chen et al., 2020) (Klaus & Maklan, 2013)	6

Variable	Items
Perceived Ease of Use	It is easy to use gamified activities It is easy to learn how to use gamification technologies and activities. It is easy to access the features of gamification when at a heritage site
Perceived Usefulness	It would make the visit easier It would improve the efficiency of getting information about the cultural heritage site Overall, I believe it would be useful at the cultural heritage site
Entertainment Gratification	I would use a gamification app at a heritage site because it is entertaining. I would use a gamification app at a heritage site because it is fun. I would use a gamification app at a heritage site because I enjoy it.
Information Seeking Gratification	It is more convenient than accessing information from other sources It will help me find specific locations, parts of the exhibition, or amenities It would provide me with varied knowledge and information about the heritage site It would provide me with immediate and up to date access to information
Digital Savviness	I would prefer to read information about the heritage site on the gamification app rather than in a brochure. I am interested in new technologies. In general, I find it easy to use new technologies It would be easy for me to use the gamification app and to find the information I wanted about the heritage site
Use of Gamification	I will use gamification applications when available at cultural heritage sites I will recommend the gamification app to friends and family when they visit the cultural heritage site Other visitors using the gamification app would make me also use the app
Visitor Experience	Having gamification technology during my visit would make me feel more engaged It would be engaging because of the virtual rewards (levels, badges, etc.) I would feel good about using it to explore the cultural heritage site I would feel more satisfied with the experience it provides at the cultural heritage site Using the gamification app would stimulate my senses (e.g., visually appealing, immersive sounds). I would feel emotionally connected to the cultural heritage site

Monastery Mysteries

For the survey participants to be able to answer the questions well-informed, a demo was created to give them an idea of what a gamification app can look like. Monastery Mysteries is a fictional creation to showcase the possible features and look of such an application. The heritage site used for the app was J eronimos Monastery, in Lisbon, Portugal. This location is classified as a UNESCO heritage site and constitutes a good example for the application.



Figure 2: Gamification demo used in the survey

The demonstration of the application includes some of the main features of gamification according to the existing literature (Nacke & Deterding, 2017; Seaborn & Fels, 2015; Widarti & Emanuel, 2020). The app demo is made up of three screens including a branded app home screen that relates to the heritage site itself. Additionally, Monastery Mysteries also includes different types of games based on the information visitors can view at the heritage site as well as an intricate point system, badges and achievements, and leaderboards. All these features aim to encourage the feeling of competition and should create a gamified and interactive experience for the visitors.

The demonstration video in English can be found here: <https://youtube.com/shorts/ATlSeYtwinc?feature=share>

The reason for including the application demo was to give the participants a visual example of what the gamified app could look like. It also removes any pre-existing issues related to whether the participants had prior experience with gamification. By showing the demo, the participants were all provided with the same example of what a gamified destination app could look like and would be able to answer the questions with the same visual in mind, reducing the potential

cognitive bias. The demo was shown in the form of a video prior to answering the questions to ensure that the features were clear to all participants.

3.4. Data Analysis

To analyze the data collected, a series of statistical tests were conducted using IBM SPSS to examine the relationships between the independent variables (perceived ease of use, perceived usefulness, entertainment gratification, information-seeking gratification, and digital savviness), the dependent variable (visitor experience), and the mediating variable (use of gamification). Each test was selected to address specific research hypotheses and to provide a comprehensive understanding of the relationships between the variables.

First, descriptive statistics were run to understand the basic properties of the dataset. This analysis included examining the mean, standard deviation, minimum, and maximum values for each variable. By reviewing these statistics, we identified any anomalies or potential issues with the normality of data distribution, ensuring that the dataset was appropriate for further analysis.

Next, the internal consistency of the multi-item scales was assessed to measure constructs like perceived ease of use, perceived usefulness, etc. Cronbach's Alpha was used as a measure of reliability, with a value of 0.7 or higher, considered acceptable (Bonett & Wright, 2015). To confirm the factor structure of the constructs and verify that each scale measured differentiates concepts, an Exploratory Factor Analysis (EFA) was done using Principal Component Analysis with Varimax rotation. EFA allowed us to check the validity of our measures by identifying the expected factor loadings for each scale. This analysis ensured construct validity and confirmed that each scale reliably captured a unique concept.

Correlation analysis was used to examine the strength and direction of relationships between individual variables, such as the link between the 5 independent variables and use of gamification, as well as between use of gamification and visitor experience. The Pearson correlation coefficients provided insights into the associations between key variables, serving as a preliminary step before proceeding to more complex analyses like regression and mediation.

To test the hypotheses, a simple linear regression analysis was run to examine the relationships between independent and the dependent variable, the use of gamification. Linear regression provided insights into the effect of each independent variable on gamification adoption while

controlling other factors. By examining standardized coefficients, the strength and significance of each predictor were revealed, allowing Hypotheses 1 through 5 to be evaluated.

Lastly, the confirm hypothesis six and support the initial linear regression run between the use of gamification and visitor experience, a mediation analysis was conducted using a PROCESS analysis. An additional macro was installed on SPSS to be able to perform this analysis. This type of analysis highlighted the direct and indirect effect of the five independent variables as well as the role the mediating variable of use of gamification plays in impacting the visitor experience.

An overview of all analytical tests performed for the hypotheses is provided in Table 1.

Table 1: Overview of data analysis

Hypothesis	Independent Variable	Dependent Variable	Main Statistical Test
H1: Perceived ease of use significantly impacts the use of gamification	Perceived ease of use	Use of gamification	Linear Regression
H2: Perceived usefulness significantly impacts the use of gamification	Perceived usefulness	Use of gamification	Linear Regression
H3: Entertainment Gratification significantly impacts use of gamification	Entertainment gratification	Use of gamification	Linear Regression
H4: Information-seeking gratification significantly impacts the use of gamification	Information seeking gratification	Use of gamification	Linear Regression
H5: Digital Savviness significantly impacts the use of gamification	Digital Savviness	Use of gamification	Linear Regression
H6: Use of gamification leads to a positive visitor experience	Use of gamification	Visitor experience	Linear Regression Mediator Analysis

4. DATAANALYSIS

The previous chapter described the methodology used for this study. This chapter will summarize the results of our analysis. It will cover the numerical data found to analyze patterns, relationships, and trends further. The first section will characterize the sample, then test the hypothesis in chapter 2 to assess whether they are accepted or rejected. All tables and graphs can be found in the *Appendix*.

4.1. Sample Characterization

The survey was closed with 331 recorded participants, of which 50 responses were removed due to incomplete answers (completion under 74%). The final sample consisted of 281 valid responses with only 4 being 74% completed and 98.8% of the answers being fully finished. The descriptive statistics indicate that the sample was varied in terms of gender, age, and education, with no clear majority indicated. However, the respondents originated mostly from Portugal (40.1%). The discrepancy between the number of answers for Age and the other variables can be explained by the fact that there were 2 screening questions installed at the start of the survey. Age and a recent visit to a cultural heritage site (within the past 2 years) were used to determine a relevant sample. As a result, only 256 participants continued the survey while those who answered “no” or “I don’t know” were redirected to the end of the survey immediately. The 1 missing value for the recent visit comes from the 1 participant who indicated “<18” for age which was also redirected to the end of the survey immediately. Tables 1 and 2 give a detailed overview of the screening question and the demographic profile of the sample.

Have you visited a cultural heritage site in the past 2 years?		
	N	%
Yes	256	91.1%
No	17	6.0%
I don't know	7	2.5%
Missing	1	0.4%

Table 2: Screening Question 2

Demographics (N = 281)

	N	%
<i>Gender</i>		
Male	124	44.1%
Female	125	44.5%
Prefer not to say	1	0.4%
Other	1	0.4%
Missing	30	10.7%
<i>Age</i>		
<18	1	0.4%
18-24	52	18.5%
25-34	79	28.1%
35-44	46	16.4%
45-54	61	21.7%
55-64	33	11.7%
>65	9	3.2%
<i>Education</i>		
Less than high school	1	0.4%
High school	22	7.8%
Some college (no degree)	38	13.5%
Bachelor's degree	92	32.7%
Master's degree	85	30.2%
Doctoral degree	14	5.0%
Missing	29	10.3%
<i>Nationality</i>		
Portugal	113	40.2%
Spain	1	0.4%
France	12	4.3%
Germany	7	2.5%
Belgium	7	2.5%
USA	10	3.6%
Netherlands	1	0.4%

Brazil	3	1.1%
United Kingdom	21	7.5%
Canada	6	2.1%
Chile	6	2.1%
Italy	6	2.1%
Poland	19	6.8%
South Africa	16	5.7%
Other	21	7.5%
Prefer not to say	3	1.1%
Missing	29	10.3%

Table 3: Demographics

As this study did not have many criteria for participants to complete the survey, a diverse sample has been collected. This varied sample can therefore provide insights into various age groups and differences in the adoption of gamification.

4.2. Data Analysis

4.2.1 Preliminary Analysis

As a first step in the data analysis, a preliminary analysis was conducted. This analysis ensures the integrity, reliability, and appropriateness of the data for further statistical tests or modeling. Table 3 indicates the mean of each item, allowing for quick identification of more favored and less favored items. Additionally, the preliminary analysis also indicated that for DS2, the observed scale only starts at 2. This indicates that the responses for this item were less varied than the other items. We can also analyze the standard deviation to further understand the variation of responses. A higher SD value indicates a greater variation across responses. Finally, normality is also assessed through Skewness and Kurtosis values which should fall between -2 and +2 to be considered acceptable. In our analysis, most values are acceptable and assume normality except ISG3 (with kurtosis 3.787) which indicates a heavy-tailed distribution and requires attention when used in parametric tests.

Table 4: Preliminary Analysis

	Mean	Scale min.	Scale max.	Observed min.	Observed max.	Std. Deviation	Skewness	Kurtosis
PEoU1	4.055	1	5	1	5	0.861	-0.996	1.206
PEoU2	4.254	1	5	1	5	0.788	-1.209	2.087
PEoU3	4.090	1	5	1	5	0.870	-0.932	0.762
PU1	3.637	1	5	1	5	0.996	-0.730	0.370
PU2	4.109	1	5	1	5	0.914	-1.058	0.914
PU3	4.039	1	5	1	5	0.969	-1.120	1.067
EG1	3.777	1	5	1	5	1.063	-0.847	0.159
EG2	3.852	1	5	1	5	1.074	-1.077	0.617
EG3	3.801	1	5	1	5	0.992	-1.025	0.895
ISG1	3.551	1	5	1	5	1.112	-0.474	-0.445
ISG2	4.016	1	5	1	5	0.872	-1.139	1.640
ISG3	4.109	1	5	1	5	0.774	-1.366	3.787
ISG4	4.016	1	5	1	5	0.863	-0.952	1.099
DS1	3.535	1	5	1	5	1.164	-0.424	-0.628
DS2	4.301	1	5	2	5	0.772	-1.041	0.860
DS3	4.328	1	5	1	5	0.758	-1.282	2.196
DS4	4.191	1	5	1	5	0.781	-0.897	0.945
UoG1	3.789	1	5	1	5	1.038	-0.884	0.459
UoG2	3.688	1	5	1	5	1.050	-0.577	-0.100
UoG3	3.871	1	5	1	5	1.042	-1.061	0.853
VE1	3.778	1	5	1	5	1.074	-0.811	0.144
VE2	3.377	1	5	1	5	1.261	-0.501	-0.812
VE3	3.813	1	5	1	5	1.018	-1.011	0.897
VE4	3.607	1	5	1	5	1.064	-0.783	0.202
VE5	3.635	1	5	1	5	1.101	-0.662	-0.183
VE6	3.500	1	5	1	5	1.102	-0.567	-0.260

Note: PEoU: Perceived Ease of Use; PU: Perceived Usefulness; EG: Entertainment Gratification; ISG: Information Seeking Gratification; DS: Digital Savviness; UoG: Use of Gamification; VE: Visitor Experience

4.2.2 Reliability and Construct Analysis

A factor analysis was conducted as an initial exploratory step. The extracted results from the rotated component matrix highlighted the underlying structure of the data by grouping the items into meaningful constructs. This analysis aims to identify which items load strongly onto the same component and are therefore assumed to measure the same underlying construct. The results from the rotated component matrix indicate that various constructs match with the items identified by us prior. Entertainment gratification, perceived ease of use, and perceived usefulness all indicate that the items we identified for the survey also have strong loadings within their respective

construct, indicating that the items we had identified do in fact measure the same underlying construct.

However, the factor analysis also indicated that there were a few cross-loadings such as information-seeking gratification. In theory, these loadings can be problematic as they do not clearly belong to one construct. The solution to this is to assign them to the component where they have the highest loading. Regardless of a few low loadings, no items were dropped at this stage and each item was assigned to its respective construct. *Appendix 2* includes the full rotated factor matrix and loadings.

As a second step in the analysis of the items and constructs, AVE and CR were measured and calculated to test the validity and reliability. AVE or average variance extracted reflects the proportion of variance explained by the factor. CR or composite reliability measures internal consistency. In addition to calculating both constructs, Cronbach’s Alpha was also calculated. This alpha is another measure of internal consistency, indicating how closely related a set of items are in a group. Table 5 provides an overview of the factor loadings, as well as AVE, CR, and Cronbach’s Alpha

Table 5: Construct Analysis

Construct and measures	Standardized loadings
Perceived Ease of Use (AVE= 0.543, CR= 0.781, α = 0.826)	
It is easy to use gamified activities	0.738
It is easy to learn how to use gamification technologies and activities.	0.688
It is easy to access the features of gamification when at a heritage site	0.782
Perceived Usefulness (AVE= 0.366, CR= 0.634, α = 0.875)	
It would make the visit easier	0.647
It would improve the efficiency of getting information about the cultural heritage site	0.592
Overall, I believe it would be useful at the cultural heritage site	0.574
Entertainment Gratification (AVE= 0.600, CR= 0.818, α = 0.925)	
I would use a gamification app at a heritage site because it is entertaining.	0.784
I would use a gamification app at a heritage site because it is fun.	0.797
I would use a gamification app at a heritage site because I enjoy it.	0.742
Information Seeking Gratification (AVE= 0.503, CR= 0.752, α = 0.855)	
It is more convenient than accessing information from other sources	0.364
It will help me find specific locations, parts of the exhibition, or amenities	0.688
It would provide me with varied knowledge and information about the heritage site	0.684
It would provide me with immediate and up to date access to information	0.754

Digital Savviness (AVE= 0.617, CR= 0.824, α = 0.745)	
I would prefer to read information about the heritage site on the gamification app rather than in a brochure	0.166
I am interested in new technologies	0.866
In general, I find it easy to use new technologies	0.872
It would be easy for me to use the gamification app and to find the information I wanted about the heritage site	0.583
Use of Gamification (AVE= 0.076, CR= 0.194, α = 0.920)	
I will use gamification applications when available at cultural heritage sites	0.315
I will recommend the gamification app to friends and family when they visit the cultural heritage site	0.287
Other visitors using the gamification app would make me also use the app	0.215
Visitor Experience (AVE= 0.535, CR= 0.774, α = 0.932)	
Having gamification technology during my visit would make me feel more engaged	0.466
It would be engaging because of the virtual rewards (levels, badges, etc.)	0.659
I would feel good about using it to explore the cultural heritage site	0.476
I would feel more satisfied with the experience it provides at the cultural heritage site	0.556
Using the gamification app would stimulate my senses (e.g., visually appealing, immersive sounds).	0.787
I would feel emotionally connected to the cultural heritage site	0.742

The threshold for AVE is ≥ 0.5 . When analyzing the results generated, we identified that the results of perceived usefulness (AVE = 0.366) and use of gamification (AVE = 0.076) fall below this threshold, indicating that less than 50% of the variance is explained through this construct. This means that there is a suggested weak convergent validity.

When analyzing the composite reliability (CR), we accept a threshold of ≥ 0.7 . Again, both perceived usefulness and use of gamification fall below this threshold, with perceived usefulness still falling within an acceptable range below 0.7. Values below 0.7 indicate that there are some issues with internal consistency. In addition, Cronbach's Alpha also measures internal consistency. The threshold is the same for both measures (≥ 0.7). When analyzing perceived usefulness, we can that although the CR falls below the desired value, Cronbach's Alpha is strong, indicating that this is likely not a problematic construct.

Finally, one critical construct that was identified is the UoG (use of gamification). In addition to AVE and CR falling below the desired threshold, the standardized loadings are also all too low to be considered valid and would harm the reliability and validity. This indicates some major issues with the mediating construct that we proposed.

These low factor loadings may indicate that the construct does not exactly measure what was intended and can be explained through a variety of reasons. It may be that the wording of the items was confusing or poor, resulting in participants not interpreting it the way that was intended. Alternatively, these items might be highly collinear if the wording was very similar, reducing their unique contribution to the overall construct of use of gamification. Although these loadings and measure results are weak, it is not possible to remove the construct as this is the mediating variable and is essential to the analysis.

To overcome the weak results for UoG, we checked the inter-item correlations to check whether the items are in fact measuring the same construct. These results can be found in *Appendix 3*. We found that the correlations between the items of UoG were high, indicating they were measuring the same construct as opposed to what the factor loadings show. This is also consistent with the high Cronbach's Alpha as this value is directly influenced by the inter-item correlation. Despite these findings, the low factor loadings imply that the items for UoG do not load well into one construct. This could mean that they do measure the use of gamification but that there is multidimensionality, meaning that they measure different aspects of gamification usage.

4.2.3 Correlations

To test the correlations, each construct was recoded into one single variable of combined means to represent a construct rather than its individual items to reduce complexity and improve interpretability. When analyzing the correlations, strong relationships are considered at the threshold of $r > 0.7$ and moderate relationships fall between $0.5 < r \leq 0.7$. Table X provides the output of the correlation analysis.

Table 6: Correlation Analysis

		Perceived Ease of Use	Perceived Usefulness	Entertainment Gratification	Information Seeking Gratification	Digital Savviness	Use of Gamification	Visitor Experience
Perceived Ease of Use	Pearson Correlation	--						
Perceived Usefulness	Pearson Correlation	.611**	--					
	Sig. (2- tailed)	0.000						
Entertainment Gratification	Pearson Correlation	.572**	.756**	--				
	Sig. (2- tailed)	0.000	0.000					
Information Seeking Gratification	Pearson Correlation	.618**	.776**	.661**	--			
	Sig. (2- tailed)	0.000	0.000	0.000				
Digital Savviness	Pearson Correlation	.642**	.589**	.592**	.633**	--		
	Sig. (2- tailed)	0.000	0.000	0.000	0.000			
Use of Gamification	Pearson Correlation	.618**	.839**	.810**	.780**	.643**	--	
	Sig. (2- tailed)	0.000	0.000	0.000	0.000	0.000		
Visitor Experience	Pearson Correlation	.576**	.783**	.819**	.750**	.642**	.847**	--
	Sig. (2- tailed)	0.000	0.000	0.000	0.000	0.000	0.000	

** . Correlation is significant at the 0.01 level (2-tailed).

The results indicate that all relationships between variables are positive, as all $r > 0$. Additionally, all relationships are statistically significant ($p < 0.005$). When analyzing the mediating relationship, $r=0.847$, between Use of Gamification and Visitor Experience we can establish that increased use of gamification strongly correlates with a better visitor experience.

The analysis proves significant relationships between the independent variable constructs and the use of gamification as the dependent variable. Perceived Ease of Use ($r=0.618$) shows that gamification systems that are easier to use are more likely to be adopted by users, aligning with the Technology Acceptance Model (TAM), which emphasizes ease of use as a critical determinant of technology adoption. Similarly, Perceived Usefulness ($r=0.839$) strongly predicts the adoption of gamification systems, highlighting the importance of users perceiving these systems as beneficial or helpful. Information Seeking Gratification ($r=0.780$) further indicates that individuals who engage with gamification tools for obtaining information, such as details about a heritage site, are more likely to use these systems.

Additionally, the correlation ($r=0.756$) between Perceived Usefulness and Entertainment Gratification suggests a conceptual or statistical overlap between these variables, indicating that perceived usefulness and entertainment value may influence users' motivation to adopt gamified systems similarly.

4.3. Hypothesis Testing

To test hypotheses 1 through 5 proposed in Chapters 2 and 3 are tested using multiple regression, followed by simple linear regressions for each hypothesis. These tests examine the strength of the relationship between the independent and dependent variables, in this case, the Use of Gamification. The output of the hypothesis testing can be found in *Appendix 4*.

4.3.1 Multiple Regression

To start the hypotheses testing, we first conducted a multiple-regression analysis to test the effect of all independent variables (PEoU, PU, EG, ISG, and DS) on the dependent variable (UoG) simultaneously. The test result indicated that 80.70% of the variance in the Use of Gamification is explained by the independent variables, indicating a very strong and meaningful relationship between the factors influencing the use of gamification and the mediator. Additionally, the results also revealed that we can confirm 4 out of 5 hypotheses due to their significance level. With multiple regression, we reject hypothesis 1: Perceived ease of use positively impacts the use of gamification. The standardized Beta coefficients indicate the strength of the relationship between each variable and the use of gamification. These values can be interpreted as an increase of 1 for perceived usefulness will result in an increase of 0.354 in the use of gamification, indicating a positive relationship.

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.898	.807	.803	.43038

Coefficients

Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.	95.0% Confidence Interval for B	
	B	Std. Error	Beta			Lower Bound	Upper Bound
1 (Constant)	-0.758	0.181		-4.174	0.000	-1.115	-0.400

Perceived Ease of Use	0.029	0.053	0.021	0.539	0.590	-0.076	0.134
Perceived Usefulness	0.399	0.059	0.354	6.806	0.000	0.283	0.514
Entertainment Gratification	0.337	0.044	0.338	7.589	0.000	0.250	0.424
Information Seeking Gratification	0.274	0.061	0.216	4.516	0.000	0.154	0.393
Digital Savviness	0.121	0.059	0.083	2.066	0.040	0.006	0.237

a. Dependent Variable: Use of Gamification

4.3.2 Perceived Ease of Use

A simple linear regression was run to test hypothesis one with Perceived Ease of Use as the independent variable and Use of Gamification as the dependent variable. We used this statistical test to complement the results from the multiple regression and to get a closer look at each hypothesis individually. The PEOU explains 38.2% of the variance in the UoG, indicating a meaningful relationship between both variables. The relationship between both is statistically significant ($p < .001$; $F = 157.24$). Consequently, Perceived Ease of Use proved to be an important predictor of Use of Gamification. The linear regression has highlighted a strong and positive relationship ($\beta = 0.618$, $p < 0.001$) where an increase in Perceived Ease of Use results in a rise of 0.618 in Use of Gamification. As a result, we accept H1: Perceived ease of use positively impacts the adoption of gamification.

Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error	Beta		
1 (Constant)	0.363	0.277		1.313	0.190
Perceived Ease of Use	0.827	0.066	0.618	12.539	0.000

a. Dependent Variable: Use of Gamification

4.3.3 Perceived Usefulness

A second simple linear regression was run to test hypothesis two with Perceived Usefulness as the independent variable and Use of Gamification as the dependent variable. The R^2 explains that the Perceived Usefulness accounts for 70.5% of the variance in the UoG. This means that there is a meaningful relationship between both variables. The analysis also highlighted that this relationship is also statistically significant ($F = 606.12$; $p < .001$). The coefficients table explains that there is a strong and positive correlation between both variables ($\beta = 0.839$; $p < .001$) where a rise in Perceived

Usefulness results in a 0.839 increase in the Use of Gamification. Therefore, we accept H2: Perceived usefulness positively impacts the adoption of gamification.

Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error	Beta		
1 (Constant)	0.065	0.155		0.422	0.674
Perceived Usefulness	0.946	0.038	0.839	24.620	0.000

a. Dependent Variable: Use of Gamification

4.3.4. Entertainment Gratification

Another simple linear regression was run to test hypothesis two with Entertainment Gratification as the independent variable and Use of Gamification as the dependent variable. The EG accounts for 65.5% of the variance in the UoG, suggesting a significant relationship between the two variables. The relationship between the two is statistically significant ($p < .001$; $F = 85.27$). As a result, Entertainment Gratification was shown to be a significant predictor of Gamification Usage. The linear regression has indicated a strong and positive correlation ($\beta = 0.810$, $p < 0.001$) wherein an increase in Entertainment Gratification leads to an increase of 0.810 in the Use of Gamification. As a result, we accept H3: Entertainment gratification positively impacts the adoption of gamification.

Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error	Beta		
1 (Constant)	0.709	0.144		4.925	0.000
Entertainment Gratification	0.807	0.037	0.810	22.029	0.000

a. Dependent Variable: Use of Gamification

4.3.5 Information Seeking Gratification

The following simple linear regression was run to test hypothesis four with Information Seeking Gratification as the independent variable and Use of Gamification as the dependent variable. The relationship between both variables is positive with 60.9% of the variance in UoG that can be explained through ISG. The relationship is statistically significant ($p < .001$; $F = 395.345$). Subsequently, Information Seeking Gratification has also been proven to be an important predictor

of the Use of Gamification. The results indicate a strong and positively meaningful relationship ($\beta=0.780$, $p<0.001$) where an increase in Information Seeking Gratification results in a rise of 0.780 in the Use of Gamification. As a result, we accept H4: Information-seeking gratification positively impacts the adoption of gamification.

Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error	Beta		
1 (Constant)	-0.103	0.199		-0.517	0.606
Information Seeking Gratification	0.990	0.050	0.780	19.883	0.000

a. Dependent Variable: Use of Gamification

4.3.6 Digital Savviness

A separate simple linear regression was conducted to evaluate hypothesis five, with Digital Savviness (DS) as the independent variable and Use of Gamification (UoG) as the dependent variable. The analysis revealed that DS accounts for 41.3% of the variance in UoG, signifying a substantial relationship between the two variables. This relationship was found to be statistically significant ($p < .001$; $F = 178.80$). Thus, Digital Savviness emerged as a significant predictor of the Use of Gamification. The regression demonstrated a strong, positive association ($\beta = 0.643$, $p < 0.001$), indicating that an increase in Information Seeking Gratification leads to a 0.643 rise in the Use of Gamification. Consequently, H5 is supported: Digital Savviness positively influences the adoption of gamification.

Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error	Beta		
1 (Constant)	-0.039	0.290		-0.136	0.892
Digital Savviness	0.935	0.070	0.643	13.372	0.000

a. Dependent Variable: Use of Gamification

4.3.7 Use of Gamification

To test the mediator variable “Use of Gamification”, we first conducted a simple linear regression as with the previous variables but with Visitor Experience as the dependent variable and Use of Gamification as the independent variable. The UoG explains 71.6% of the variance in the VE, indicating a meaningful relationship between both variables. The relationship between both is

statistically significant ($p < .001$; $F = 633.43$). Consequently, the Use of Gamification proved to be an important predictor of the Visitor Experience. The linear regression has highlighted a strong and positive relationship ($\beta = 0.847$, $p < 0.001$) where an increase in the Use of Gamification results in a rise of 0.847 in the Visitor Experience.

Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error	Beta		
1 (Constant)	0.476	0.129		3.689	0.000
Use of Gamification	0.831	0.033	0.847	25.168	0.000

a. Dependent Variable: Visitor Experience

4.4. Mediation Analysis (PROCESS)

To test the indirect effects (mediation), we installed the PROCESS macro on SPSS to run an additional regression analysis. To run this analysis, we ran five repeated tests, in which we coded the five factors (PEoU, PU, EG, ISG, and DS) as X, the mediator, UoG, as M, and the dependent variable VE as Y. The goal of conducting this analysis is to measure the mediator (Use of Gamification) and its role in the relationship between the independent variables (five factors) and the dependent variable of Visitor Experience.

4.4.1 Perceived Ease of Use

The first part of the output generated by the PROCESS Macro (model 4) confirms the findings we stated earlier where the relationship between PEoU and UoG was tested. The full matrix can be found in *Appendix 5*. Therefore, we will only focus on the direct and indirect effects on the visitor experience. The output of the matrix indicates that PEoU has a small but statistically significant direct effect on VE ($\beta = 0.1178$, $p = 0.0367$) without considering UoG. When analyzing the indirect effect, we can identify that there is a substantial mediation (indirect) effect ($\beta = 0.6443$). We can conclude that although the direct effect of PEoU on VE is significant, the role of the mediator (UoG) has a much stronger role in influencing VE.

4.4.2 Perceived Usefulness

The same mediation analysis was conducted for Perceived Usefulness. The results indicated that the direct effect of PU on the Visitor Experience is statistically significant but rather small ($\beta = 0.272$; $p < .001$). When analyzing the indirect impact of the mediator on VE, there is a stronger

effect, indicating a significant mediation ($\beta=0.598$). As a result, we can conclude that the role of the mediator is significant in impacting Visitor Experience as the direct relationship between Perceived Usefulness and Visitor Experience is much smaller.

4.4.3 Entertainment Gratification

A third mediation analysis using the PROCESS macro was conducted to study the direct and indirect relationship between Entertainment Gratification and Visitor Experience. The results showed that the direct effect of EG on VE is strong and statistically significant ($\beta=0.382$; $p<.001$) but that the effect through the mediated pathway (through UoG), the effect is stronger ($\beta=0.429$). This shows that UoG mediates the relationship between EG and VE, but that the direct effect of EG also has a direct impact on VE.

4.4.4 Information Seeking Gratification

The same analysis was conducted on the independent variable Information Seeking Gratification. The direct effect of ISG on Visitor Experience resulted in a small but statistically significant effect ($\beta= 0.283$; $p<.001$). The indirect effect of ISG on VE showed a much stronger effect ($\beta=0.657$), indicating that the mediated path has the strongest effect on the Visitor Experience.

4.4.5 Digital Savviness

The final mediator analysis was conducted using Digital Savviness as the independent variable with the mediator remaining Use of Gamification to test the dependent variable of Visitor Experience. The final test highlighted that there is a small direct effect of DS on VE which is statistically significant ($\beta= 0.244$; $p<.001$). However, the indirect effect of going through the mediator showed a much stronger impact on the Visitor Experience ($\beta= 0.684$).

The PROCESS analysis alongside the linear regression discussed prior both indicate that Use of Gamification has a positive effect on the Visitor Experience. The PROCESS results highlight that the strongest effect on VE comes through the UoG, indicating that this mediator plays a significant role in affecting visitor experience. Therefore, we also accept the final hypothesis, H6: Adoption of gamification leads to a positive visitor experience.

H1: Perceived ease of use has a positive impact on the use of gamification	Accepted
H2: Perceived usefulness has a positive impact on the use of gamification	Accepted

H3: Entertainment gratification has a positive impact on the use of gamification	Accepted
H4: Information-seeking gratification has a positive impact on the use of gamification	Accepted
H5: Digital savviness has a positive impact on the use of gamification	Accepted
H6: Adoption of gamification leads to a positive visitor experience	Accepted

5. RESULTS DISCUSSION

This study aimed to understand whether the use of gamification would have a positive impact on visitor experience at cultural heritage sites. Through a comprehensive review of relevant literature and subsequent primary data collection through an online questionnaire and detailed data analysis, several key insights were collected that provide a conclusion about the factors affecting the adoption of gamification and their indirect impact on the visitor experience.

5.1. Results Interpretation

The results of this study align with and build upon the findings presented in the literature review, providing new insights into the adoption and impact of gamification in cultural heritage tourism. The literature showed gamification as a tool for enhancing engagement and delivering improved experiences, particularly through concepts like entertainment gratification and information-seeking (Deterding et al., 2011; Malik et al., 2024; Widarti & Emanuel, 2020). Similarly, this study found that gamification positively influences visitor experience, specifically at cultural heritage sites by making them more interactive, engaging, and educational. Our results support the claim that gamified tools can transform a visitor's interaction with heritage sites, as proposed by Swacha & Ittermann (2017) and Gao & Wu (2017). Additionally, this study extends the application of the TAM principles, confirming the role of perceived ease of use and perceived usefulness in the adoption of gamification within the context of cultural heritage sites. Davis (1989) highlighted these factors as fundamental to technology adoption, which was supported by the tourism-specific research of Malik et al. (2024). Our study confirmed that visitors are more likely to use gamified tools when they find them intuitive and beneficial for navigating and understanding heritage sites. This supports the argument made by Widarti & Emanuel (2020) that ease of use and usability are significant for successful implementation in heritage tourism.

Moreover, the study's findings regarding entertainment gratification and information-seeking gratification align with the Uses and Gratifications (U&G) framework. The study highlights that entertainment gratification motivates visitors by making their experiences enjoyable and engaging while information-seeking gratification fulfills their desire to learn and connect more deeply with the cultural heritage site. The positive impact of these factors on gamification adoption aligns with research by Malik et al. (2024), who argued that individuals are motivated to adopt gamified technologies to fulfill their need for entertainment and gain knowledge. Our study expands upon

this thought by showing how these gratifications facilitate the relationship between gamification adoption and visitor experience. The significance of digital savviness in influencing gamification reflects wider concepts identified in the literature. Previous studies, such as those by Panagiotarou et al. (2020), identified digital fluency as an important factor in technology engagement across various fields. Our study confirms that visitors with higher digital savviness are more likely to adopt gamified tools, highlighting the need for inclusive designs that accommodate varying levels of digital proficiency, as discussed by Wang et al. (2013).

Finally, the role of gamification as a mediator in enhancing visitor experience aligns with the theoretical assertions of experiential marketing. Pine & Gilmore (1998) emphasized the hyperpersonal nature of experiences, and this study demonstrates how gamified tools can create immersive, memorable encounters at cultural heritage sites

5.2. Research Questions

This research posed four initial research questions that have been answered throughout this study. The first question was related to the extent of studies conducted and implemented in the field of gamification in the tourism industry. From the literature review, we have found that the term gamification was defined by Deterding et al. (2011), which was followed by an exponential increase in studies related to the topic. Xu et al. (2013) highlighted that gamification in tourism specifically can take on many different formats which can be useful for DMOs. A few examples of the application of gamification in tourism are to enhance a visit to historical sites, education at religious temples, the use of AR/VR for the preservation of historic cultural elements, and increase engagement for tourists with the location (Benedek & Szöllösi, 2023; Buhalis & Sinarta, 2019; Mendoza et al., 2023; Widarti & Emanuel, 2020). As a result, we conclude that gamification has been studied significantly in past literature, even within the tourism domain. However, since there are a wide variety of tourism types and there exists a lack of studies conducted specifically in cultural heritage tourism, this study can be considered a contribution to the expanding literature while also shedding light on the specific needs and interactions of tourists with cultural heritage sites. The second research question that we posed at the start of this study was the following: How does the use of gamification influence visitors' experience at cultural heritage sites? To approach this, we based our (quantitative) study on the concepts of Malik et al. (2024) who suggested using the TAM and the U&G models to test the adoption of gamification and used the concepts of Chen

et al. (2020) to understand how this may affect the visitor experience. The findings shown in Chapter 4 provide an answer to this research question demonstrating that gamification enhances visitors' experiences at cultural heritage sites by improving engagement, delivering engaging and informational interactions, and allowing for a deeper connection to the historical site. The mediating role of gamification highlights its value as a method for translating usability, utility, amusement, and digital savviness into a meaningful and satisfying visitor experience.

The third research question, “What are the key factors to the adoption of gamification that influence the visitor’s experience at cultural heritage sites?”, was also answered through the data analysis. We found that the adoption of gamification was most strongly influenced by perceived usefulness, entertainment gratification, and information-seeking gratification. We concluded that these factors work together to increase the intended use of gamification which in turn mediates the impact of each factor and ultimately enhances the visitor’s experience. Practical implications for cultural heritage site managers include prioritizing gamification elements that emphasize ease of use, entertainment, and knowledge enrichment to optimize visitor satisfaction. The final research question related to whether gamification adoption differs depending on the indicated digital savviness. We tested this question through the 4 proposed items in the online questionnaire. The results show that the effectiveness of gamification is significantly influenced by digital savviness. Visitors with higher digital savviness are more likely to adopt gamification technologies and experience enhanced engagement, satisfaction, and emotional connection. To ensure all visitors feel comfortable using gamification, the systems should be designed to cater to varying levels of digital proficiency, namely by incorporating intuitive designs and customizable difficulty levels.

6. CONCLUSIONS AND FURTHER RESEARCH

This final chapter will focus on the conclusions of the study and provide a clear interpretation of the results discussed in Chapter 5. We will highlight the implications of these results, both from a theoretical and a managerial perspective. Finally, we will highlight the limitations of this study and provide suggestions for further research.

6.1. Conclusion

Our research explored the use of gamification as a tool for enhancing visitor experiences at cultural heritage sites. By examining key factors that influence gamification use and analyzing its role as a mediator in enhancing visitor experiences, this research has provided significant insights into both theoretical frameworks and practical applications of gamification in tourism, specifically cultural heritage tourism.

The findings showed that gamification can be used to enhance visitor engagement. Visitors are more likely to adopt and use gamification when they perceive it as being easy to use, useful, entertaining, and informative. Additionally, consumers/tourists' digital savviness emerged as an additional determinant of adoption/use, highlighting the need to consider varying levels of technological familiarity among visitors. The mediating role of gamification highlighted its ability to turn these factors into positive visitor experiences, validating its value as a tool for destination management organizations (DMOs) and cultural heritage managers.

6.2. Theoretical and Managerial Implications

Our study provides valuable insights into the use of gamification to enhance visitor experience, with significant implications from both theoretical and managerial perspectives.

Specifically, this study has focused on the application of gamification at cultural heritage sites. We identified an existing gap in the literature regarding the role of gamification in tourism, particularly regarding visitor experience (la Cuadra et al., 2020; Pine & Gilmore, 1998). We also found that studying visitor experience is a challenging concept as it is influenced by a variety of factors, some of which fall beyond the control of managers (la Cuadra et al., 2020; Pine & Gilmore, 1998). Our study contributes to advancing research in the field of gamification within cultural heritage tourism. By understanding the impact of the TAM and U&G variables, we have been able to provide insights into which factors affect the intention to use gamification. Additionally, we have

established that each of these factors indirectly contributes to the visitor experience. Thus, this study serves as a theoretical foundation for further research into gamification in this specific context, as well as the broader concept of gamification for visitor experience in diverse settings. From a managerial perspective, the findings of our research can provide practical guidance for destination management organizations and other stakeholders involved and concerned with the visitors' experience in tourism. Our results indicate that gamification features can significantly enhance the visitor experience and engagement, specifically at cultural heritage sites. Aside from the direct relation with the tourism industry, the results of this study may also be replicable in other contexts such as retail where the introduction of gamification may lead to enhanced customer experience. However, it is important to note that further, more detailed research would have to be conducted to establish a broader range of potential outcomes.

6.3. Limitations and Future Research

While the study provides valuable insights, several limitations should be acknowledged. The sample of our study was relatively small, given that the study intends to reflect a general concept. To develop results that are generalizable to the general population, a more substantial sample would be required to create a representative sample. Additionally, although responses were collected from diverse demographics, a significant portion of our sample originated from Portugal, limiting the generalizability. Another limitation of the online questionnaire was the reliance on self-reported data, meaning that participants had little guidance while answering the survey. This could affect the interpretation of the participants and affect the robustness of the conclusions drawn. A final limitation of the quantitative data was reported by a few testing participants. They remarked that the questionnaire felt very repetitive. This feedback raises the concern that there is possible response fatigue among participants, affecting the reliability of the answers provided.

A suggestion for future research would be to explore alternative research methodologies to mitigate these limitations and concerns. One suggested approach could be to conduct a similar study in the setting of a field experiment. It would require the development of a functional demonstration app so that participants can truly experience the use of gamification during their visit. Using a field experiment would also allow participants to ask for clarifications during the study, reducing potential issues with unclear instructions.

Another limitation lies in the study's focus on a single gamification example (Monastery Mysteries) and specific features. The findings may not fully capture the diversity of gamification strategies and technologies that could be applied in cultural heritage sites. Additionally, our study did not specifically test the impact of specific gamification features (achievements, badges, etc.) but rather focused on the general concept of gamification.

Lastly, while the study highlights the significant role of gamification in improving visitor experiences, it does not examine the sustainability implications of these technologies, which could be critical for cultural heritage preservation.

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8. APPENDIX

8.1 Online Questionnaire

Thank you for participating in this survey on the use of gamification in tourism which is part of my master's dissertation at Católica Lisbon.

Please be assured that your responses will remain completely anonymous and confidential. The data collected will be used solely for academic research purposes and will only be presented in aggregate form in my thesis, ensuring no individual responses can be identified.

The survey will take approximately 5 minutes to complete. Participation is entirely voluntary, and you may withdraw at any time by closing the survey. There are no right or wrong answers, so please respond as honestly as possible. Please take the study in one go, without interruptions.

If you have any questions or concerns about this study, please email Julie De Wever (s-jwever@ucp.pt).

By continuing you agree to participate.

Thank you for your valuable contribution to this research!

! This questionnaire is available in English, French, Portuguese, and Spanish. To change, select the desired language in the top right corner!

--

1.1 What is your age?

<18 (Unfortunately, you do not fit into the scope of this research. Thank you for participating and all the best)

18-24

25-34

35-44

45-54

1.2 Have you visited a cultural heritage site in the past 2 years?

Cultural heritage sites include historic buildings and town sites, important archaeological sites, and works of monumental sculpture or painting. Some popular examples include the Tour Eiffel, the Louvre Museum, Versailles' Palace, Rome's Coliseum, the London Tower, and Barcelona's Sagrada Familia Cathedral. Although these are extremely famous, a cultural heritage site may be on a smaller scale such as a castle or cathedral.

- Yes

- No (Unfortunately, you do not fit into the scope of this research. Thank you for participating and all the best)

- I don't know (Unfortunately, you do not fit into the scope of this research. Thank you for participating and all the best)

--

Before we truly begin, if you are not familiar with the concept of gamification, please review the visual demonstration below, which shows the Monastery Mysteries app. This app is an example of gamification used in tourism, namely a heritage site, featuring quizzes, a leveling system, personalized profiles, and leaderboards to enhance the visitor experience. Please keep this example in mind as you respond to the questions that will follow.

--

Please keep the demo you have just seen in mind.

Now imagine you are visiting a cultural heritage site (remember these can be monuments, museums, cathedrals, castles, natural places, etc.):

In the following part, I will ask you to indicate your level of agreement from 1 = strongly disagree to 5 = strongly agree, with each statement, based on your perceptions towards gamification implemented at a cultural heritage site, as described.

2.1 I would find it easy to use a gamification application at the cultural heritage site

1 - Strongly disagree

2 - Disagree

3 - Neither agree nor disagree

4 - Agree

5 - Strongly agree

2.2 I would find it easy to learn how to use the gamification application

1 - Strongly disagree

2 - Disagree

3 - Neither agree nor disagree

4 - Agree

5 - Strongly agree

2.3 It would be easy for me to access the gamification app when visiting a cultural heritage site

1 - Strongly disagree

2 - Disagree

3 - Neither agree nor disagree

4 - Agree

5 - Strongly agree

--

3.1 Gamification would make the visit easier

1 - Strongly disagree

2 - Disagree

3 - Neither agree nor disagree

4 - Agree

5 - Strongly agree

3.2 Gamification would improve the efficiency of getting information about the cultural heritage site

1 - Strongly disagree

2 - Disagree

3 - Neither agree nor disagree

4 - Agree

5 - Strongly agree

3.3 Overall, I believe gamification would be useful at the cultural heritage site

1 - Strongly disagree

2 - Disagree

3 - Neither agree nor disagree

4 - Agree

5 - Strongly agree

--

4.1 I would use a gamification app at a heritage site because it is entertaining.

1 - Strongly disagree

2 - Disagree

3 - Neither agree nor disagree

4 - Agree

5 - Strongly agree

4.2 I would use a gamification app at a heritage site because it is fun.

1 - Strongly disagree

2 - Disagree

3 - Neither agree nor disagree

4 - Agree

5 - Strongly agree

4.3 I would use a gamification app at a heritage site because I believe I would enjoy it.

1 - Strongly disagree

2 - Disagree

3 - Neither agree nor disagree

4 - Agree

5 - Strongly agree

--

5.1 It would be more convenient to access information through the gamification app than through other sources

1 - Strongly disagree

2 - Disagree

3 - Neither agree nor disagree

4 - Agree

5 - Strongly agree

5.2 A gamification app would be helpful to find specific locations, parts of the exhibition, or amenities at the cultural heritage site

1 - Strongly disagree

2 - Disagree

3 - Neither agree nor disagree

4 - Agree

5 - Strongly agree

5.3 A gamification app would provide me with varied knowledge and information about the cultural heritage site

1 - Strongly disagree

2 - Disagree

3 - Neither agree nor disagree

4 - Agree

5 - Strongly agree

5.4 A gamification app would provide me with immediate and up-to-date access to information

1 - Strongly disagree

2 - Disagree

3 - Neither agree nor disagree

4 - Agree

5 - Strongly agree

--

6.1 I would prefer to read information about the heritage site on the gamification app rather than in a brochure.

1 - Strongly disagree

2 - Disagree

3 - Neither agree nor disagree

4 - Agree

5 - Strongly agree

6.2 I am interested in new technologies.

1 - Strongly disagree

2 - Disagree

3 - Neither agree nor disagree

4 - Agree

5 - Strongly agree

6.3 In general, I find it easy to use new technologies

1 - Strongly disagree

2 - Disagree

3 - Neither agree nor disagree

4 - Agree

5 - Strongly agree

6.4 It would be easy for me to use the gamification app and to find the information I wanted about the heritage site

1 - Strongly disagree

2 - Disagree

3 - Neither agree nor disagree

4 - Agree

5 - Strongly agree

--

7.1 I will use gamification applications when available at cultural heritage sites

1 - Strongly disagree

2 - Disagree

3 - Neither agree nor disagree

4 - Agree

5 - Strongly agree

7.2 I will recommend the gamification app to friends and family when they visit the cultural heritage site

1 - Strongly disagree

2 - Disagree

3 - Neither agree nor disagree

4 - Agree

5 - Strongly agree

7.3 Gamification would make the cultural heritage site visit more interesting

1 - Strongly disagree

2 - Disagree

3 - Neither agree nor disagree

4 - Agree

5 - Strongly agree

7.4 I would like using a gamification app at a cultural heritage site

1 - Strongly disagree

2 - Disagree

3 - Neither agree nor disagree

4 - Agree

5 - Strongly agree

--

8.1 Having a gamification app during my visit to the heritage site would make me feel more engaged

1 - Strongly disagree

2 - Disagree

3 - Neither agree nor disagree

4 - Agree

5 - Strongly agree

8.2 My experience of using the gamification app when visiting the heritage site would be more engaging if using the gamification app because of the virtual rewards (levels, badges, etc.)

1 - Strongly disagree

2 - Disagree

3 - Neither agree nor disagree

4 - Agree

5 - Strongly agree

8.3 I would feel good about using the gamification app to explore the cultural heritage site

1 - Strongly disagree

2 - Disagree

3 - Neither agree nor disagree

4 - Agree

5 - Strongly agree

8.4 By using the gamification app, I would feel more satisfied with the experience it provides at the cultural heritage site

1 - Strongly disagree

2 - Disagree

3 - Neither agree nor disagree

4 - Agree

5 - Strongly agree

8.5 Using the gamification app would stimulate my senses (e.g., visually appealing, immersive sounds).

1 - Strongly disagree

2 - Disagree

3 - Neither agree nor disagree

4 - Agree

5 - Strongly agree

8.6 Using the gamification app at the cultural heritage site would stimulate my emotions (e.g., happiness, excitement, enjoyment...)

1 - Strongly disagree

2 - Disagree

3 - Neither agree nor disagree

4 - Agree

5 - Strongly agree

--

9.1 What is your gender?

Male

Female

Other

Prefer not to say

9.2 What is your level of education?

Less than High School

High school

Some college (no degree)

Bachelor's degree (4-year)

Master's degree

Doctoral degree

Prefer not to say

9.3 Where are you from?

- Portugal

- Spain

- France

- Germany

- Belgium

- USA

- China

- Netherlands

- Brazil

- United Kingdom

- Other: Please specify

-- Thank you for your response! Your participation is highly appreciated.

8.2 Rotated Factor Matrix

	Entertainment Gratification	Visitor Experience	Information Seeking Gratification	Perceived Ease of Use	Perceived Usefulness	Digital Savviness	Cross-loadings
PEoU1	0.224	0.219	0.207	0.738	0.240	0.198	0.080
PEoU2	0.258	0.110	0.264	0.688	-0.069	0.345	0.059
PEoU3	0.112	0.146	0.165	0.782	0.216	0.145	0.149
PU1	0.327	0.285	0.135	0.307	0.647	0.058	0.310
PU2	0.374	0.198	0.461	0.110	0.592	0.182	0.069
PU3	0.449	0.300	0.392	0.211	0.574	0.167	0.017
EG1	0.784	0.312	0.178	0.172	0.178	0.098	0.192
EG2	0.797	0.358	0.146	0.150	0.116	0.166	0.127
EG3	0.742	0.199	0.236	0.280	0.279	0.114	0.193
ISG1	0.209	0.286	0.364	0.175	0.359	0.070	0.599
ISG2	0.152	0.162	0.688	0.228	0.277	0.177	0.238
ISG3	0.276	0.264	0.684	0.221	0.273	0.100	0.112
ISG4	0.247	0.218	0.754	0.215	0.046	0.071	0.237
DS1	0.344	0.245	0.229	0.133	0.077	0.166	0.762
DS2	0.151	0.175	0.020	0.082	0.119	0.866	0.115
DS3	0.068	0.059	0.121	0.267	0.045	0.872	0.083
DS4	0.136	0.182	0.478	0.285	0.100	0.583	-0.028
UoG1	0.497	0.328	0.291	0.184	0.437	0.162	0.315
UoG2	0.379	0.421	0.314	0.273	0.383	0.139	0.287
UoG3	0.581	0.336	0.359	0.227	0.377	0.101	0.215
VE1	0.531	0.466	0.275	0.204	0.240	0.098	0.226
VE2	0.354	0.659	0.191	0.107	0.262	0.202	0.038
VE3	0.524	0.476	0.452	0.149	0.217	0.166	0.144
VE4	0.501	0.556	0.313	0.080	0.315	0.156	0.226
VE5	0.271	0.787	0.161	0.188	0.098	0.115	0.208
VE6	0.307	0.742	0.232	0.198	0.147	0.129	0.186

Extraction Method: Principal Component Analysis.
 Rotation Method: Varimax with Kaiser Normalization.
 a. Rotation converged in 8 iterations.

8.3 Correlation Analysis

Correlations

		UoG1	UoG2	UoG3
UoG1	Pearson Correlation	1	.782**	.824**
	Sig. (2-tailed)		<.001	<.001
	N	256	256	256
UoG2	Pearson Correlation	.782**	1	.777**
	Sig. (2-tailed)	<.001		<.001
	N	256	256	256
UoG3	Pearson Correlation	.824**	.777**	1
	Sig. (2-tailed)	<.001	<.001	
	N	256	256	256

** . Correlation is significant at the 0.01 level (2-tailed).

Confidence Intervals

	Pearson Correlation	Sig. (2-tailed)	95% Confidence Intervals (2-tailed) ^a	
			Lower	Upper
UoG1 - UoG2	.782	<.001	.729	.825
UoG1 - UoG3	.824	<.001	.780	.859
UoG2 - UoG3	.777	<.001	.723	.821

a. Estimation is based on Fisher's r-to-z transformation.

8.4 Hypothesis Testing Output

8.4.1 Perceived Ease of Use

Variables Entered/Removed^a

Model	Variables Entered	Variables Removed	Method
1	Perceived Ease of Use ^b		Enter

a. Dependent Variable: Use of Gamification

b. All requested variables entered.

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	R Square Change	Change Statistics			Sig. F Change
						F Change	df1	df2	
1	.618 ^a	.382	.380	.76289	.382	157.238	1	254	<.001

a. Predictors: (Constant), Perceived Ease of Use

ANOVA^a

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	91.512	1	91.512	157.238	<.001 ^b
	Residual	147.828	254	.582		
	Total	239.340	255			

a. Dependent Variable: Use of Gamification

b. Predictors: (Constant), Perceived Ease of Use

Coefficients^a

Model		Unstandardized Coefficients		Standardized	t	Sig.
		B	Std. Error	Coefficients Beta		
1	(Constant)	.363	.277		1.313	.190
	Perceived Ease of Use	.827	.066	.618	12.539	<.001

a. Dependent Variable: Use of Gamification

8.4.2 Perceived Usefulness

Variables Entered/Removed^a

Model	Variables		Method
	Entered	Removed	
1	Perceived Usefulness ^b		Enter

a. Dependent Variable: Use of Gamification

b. All requested variables entered.

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	R Square Change	Change Statistics			Sig. F Change
						F Change	df1	df2	
1	.839 ^a	.705	.704	.52751	.705	606.122	1	254	<.001

a. Predictors: (Constant), Perceived Usefulness

ANOVA^a

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	168.661	1	168.661	606.122	<.001 ^b
	Residual	70.679	254	.278		
	Total	239.340	255			

a. Dependent Variable: Use of Gamification

b. Predictors: (Constant), Perceived Usefulness

Coefficients^a

Model		Unstandardized Coefficients		Standardized	t	Sig.
		B	Std. Error	Coefficients Beta		
1	(Constant)	.065	.155		.422	.674
	Perceived Usefulness	.946	.038	.839	24.620	<.001

a. Dependent Variable: Use of Gamification

8.4.3 Entertainment Gratification

Variables Entered/Removed^a

Model	Variables		Method
	Entered	Removed	
1	Entertainment Gratification ^b		Enter

a. Dependent Variable: Use of Gamification

b. All requested variables entered.

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics				Sig. F Change
					R Square Change	F Change	df1	df2	
1	.810 ^a	.656	.655	.56899	.656	485.268	1	254	<.001

a. Predictors: (Constant), Entertainment Gratification

ANOVA^a

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	157.107	1	157.107	485.268	<.001 ^b
	Residual	82.233	254	.324		
	Total	239.340	255			

a. Dependent Variable: Use of Gamification

b. Predictors: (Constant), Entertainment Gratification

Coefficients^a

Model		Unstandardized Coefficients		Standardized	t	Sig.
		B	Std. Error	Coefficients Beta		
1	(Constant)	.709	.144		4.925	<.001
	Entertainment Gratification	.807	.037	.810	22.029	<.001

a. Dependent Variable: Use of Gamification

8.4.4 Information-seeking Gratification

Variables Entered/Removed^a

Model	Variables	Variables	Method
	Entered	Removed	
1	Information Seeking Gratification ^b		Enter

a. Dependent Variable: Use of Gamification

b. All requested variables entered.

Model Summary

Model	R	Adjusted R Square	Std. Error of the Estimate	Change Statistics			Sig. F Change	
				R Square Change	F Change	df1		df2
1	.780 ^a	.609	.607	.609	395.345	1	254	<.001

a. Predictors: (Constant), Information Seeking Gratification

ANOVA^a

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	145.719	1	145.719	395.345	<.001 ^b
	Residual	93.621	254	.369		
	Total	239.340	255			

a. Dependent Variable: Use of Gamification

b. Predictors: (Constant), Information Seeking Gratification

Coefficients^a

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	-.103	.199		-.517	.606
	Information Seeking Gratification	.990	.050	.780	19.883	<.001

a. Dependent Variable: Use of Gamification

8.4.5 Digital Savviness

Variables Entered/Removed^a

Model	Variables Entered	Variables Removed	Method
	1	Digital Savviness ^b	

a. Dependent Variable: Use of Gamification

b. All requested variables entered.

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	R Square Change	Change Statistics			Sig. F Change
						F Change	df1	df2	
1	.643 ^a	.413	.411	.74364	.413	178.799	1	254	<.001

a. Predictors: (Constant), Digital Savviness

ANOVA^a

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	98.877	1	98.877	178.799	<.001 ^b
	Residual	140.463	254	.553		

Total	239.340	255			
-------	---------	-----	--	--	--

a. Dependent Variable: Use of Gamification

b. Predictors: (Constant), Digital Savviness

Coefficients^a

Model		Unstandardized Coefficients		Standardized	t	Sig.
		B	Std. Error	Coefficients Beta		
1	(Constant)	-.039	.290		-.136	.892
	Digital Savviness	.935	.070	.643	13.372	<.001

a. Dependent Variable: Use of Gamification

8.4.6 Use of Gamification

Variables Entered/Removed^a

Model	Variables	Variables	Method
	Entered	Removed	
1	Use of Gamification ^b		Enter

a. Dependent Variable: Visitor Experience

b. All requested variables entered.

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	R Square Change	Change Statistics			Sig. F Change
						F Change	df1	df2	
1	.847 ^a	.717	.716	.50919	.717	633.431	1	250	<.001

a. Predictors: (Constant), Use of Gamification

ANOVA^a

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	164.233	1	164.233	633.431	<.001 ^b
	Residual	64.819	250	.259		
	Total	229.051	251			

a. Dependent Variable: Visitor Experience

b. Predictors: (Constant), Use of Gamification

Coefficients^a

Model		Unstandardized Coefficients		Standardized	t	Sig.
		B	Std. Error	Coefficients Beta		
1	(Constant)	.476	.129		3.689	<.001
	Use of Gamification	.831	.033	.847	25.168	<.001

a. Dependent Variable: Visitor Experience

8.5 Mediation Analysis Output

8.5.1 PEOU

Run MATRIX procedure:							
***** PROCESS Procedure for SPSS Version 4.3.1 *****							
Written by Andrew F. Hayes, Ph.D.				www.afhayes.com			
Documentation available in Hayes (2022), www.guilford.com/p/hayes3							

Model	: 4						
Y	: VE						
X	: PEOU						
M	: UoG						
Sample	Size: 252						

OUTCOME VARIABLE:							
UoG							
Model Summary							
	R	R-sq	MSE	F	df1	df2	p
	.6150	.3782	.5910	152.0834	1.0000	250.0000	.0000
Model							
	coeff	se	t	p	LLCI	ULCI	
constant	.3574	.2818	1.2684	.2058	-.1975	.9123	
PEOU	.8286	.0672	12.3322	.0000	.6963	.9610	

OUTCOME VARIABLE:							
VE							
Model Summary							
	R	R-sq	MSE	F	df1	df2	p
	.8497	.7219	.2558	323.2468	2.0000	249.0000	.0000
Model							
	coeff	se	t	p	LLCI	ULCI	
constant	.1923	.1860	1.0339	.3022	-.1740	.5585	
PEOU	.1178	.0561	2.1008	.0367	.0074	.2282	
UoG	.7776	.0416	18.6885	.0000	.6956	.8595	
***** DIRECT AND INDIRECT EFFECTS OF X ON Y *****							
Direct effect of X on Y							
	Effect	se	t	p	LLCI	ULCI	
	.1178	.0561	2.1008	.0367	.0074	.2282	
Indirect effect(s) of X on Y:							
	Effect	BootSE	BootLLCI	BootULCI			
UoG	.6443	.0658	.5161	.7765			
***** ANALYSIS NOTES AND ERRORS *****							
Level of confidence for all confidence intervals in output:							
95.0000							
Number of bootstrap samples for percentile bootstrap confidence intervals:							
5000							
----- END MATRIX -----							

8.5.2 PU

Run MATRIX procedure:							
***** PROCESS Procedure for SPSS Version 4.3.1 *****							
Written by Andrew F. Hayes, Ph.D. www.afhayes.com							
Documentation available in Hayes (2022). www.guilford.com/p/hayes3							

Model	: 4						
Y	: VE						
X	: PU						
M	: UoG						
Sample	Size: 252						

OUTCOME VARIABLE:							
UoG							
Model Summary							
	R	R-sq	MSE	F	df1	df2	p
	.8398	.7053	.2801	598.3021	1.0000	250.0000	.0000
Model							
	coeff	se	t	p	LLCI	ULCI	
constant	.0460	.1563	.2945	.7687	-.2618	.3538	
PU	.9496	.0388	24.4602	.0000	.8732	1.0261	

OUTCOME VARIABLE:							
VE							
Model Summary							
	R	R-sq	MSE	F	df1	df2	p
	.8572	.7347	.2440	344.7958	2.0000	249.0000	.0000
Model							
	coeff	se	t	p	LLCI	ULCI	
constant	.1696	.1459	1.1624	.2462	-.1178	.4569	
PU	.2720	.0667	4.0755	.0001	.1406	.4035	
UoG	.6293	.0590	10.6604	.0000	.5130	.7456	
***** DIRECT AND INDIRECT EFFECTS OF X ON Y *****							
Direct effect of X on Y							
	Effect	se	t	p	LLCI	ULCI	
	.2720	.0667	4.0755	.0001	.1406	.4035	
Indirect effect(s) of X on Y:							
	Effect	BootSE	BootLLCI	BootULCI			
UoG	.5976	.0657	.4690	.7302			
***** ANALYSIS NOTES AND ERRORS *****							
Level of confidence for all confidence intervals in output:							
95.0000							
Number of bootstrap samples for percentile bootstrap confidence intervals:							
5000							
----- END MATRIX -----							

8.5.3 EG

```

Run MATRIX procedure:

***** PROCESS Procedure for SPSS Version 4.3.1 *****

Written by Andrew F. Hayes, Ph.D.      www.afhayes.com
Documentation available in Hayes (2022). www.guilford.com/p/hayes3

*****

Model : 4
Y : VE
X : EG
M : UoG

Sample
Size: 252

*****
OUTCOME VARIABLE:
UoG

Model Summary
      R      R-sq      MSE      F      df1      df2      p
      .8117      .6589      .3242      482.8639      1.0000      250.0000      .0000

Model
      coeff      se      t      p      LLCI      ULCI
constant      .6651      .1462      4.5479      .0000      .3771      .9531
EG      .8181      .0372      21.9742      .0000      .7447      .8914

*****
OUTCOME VARIABLE:
VE

Model Summary
      R      R-sq      MSE      F      df1      df2      p
      .8762      .7677      .2137      411.4990      2.0000      249.0000      .0000

Model
      coeff      se      t      p      LLCI      ULCI
constant      .1843      .1235      1.4920      .1370      -.0590      .4276
EG      .3815      .0517      7.3731      .0000      .2796      .4834
UoG      .5241      .0513      10.2079      .0000      .4230      .6252

***** DIRECT AND INDIRECT EFFECTS OF X ON Y *****

Direct effect of X on Y
      Effect      se      t      p      LLCI      ULCI
      .3815      .0517      7.3731      .0000      .2796      .4834

Indirect effect(s) of X on Y:
      Effect      BootSE      BootLLCI      BootULCI
UoG      .4287      .0498      .3291      .5275

***** ANALYSIS NOTES AND ERRORS *****

Level of confidence for all confidence intervals in output:
95.0000

Number of bootstrap samples for percentile bootstrap confidence intervals:
5000

----- END MATRIX -----

```

8.5.4 ISG

Run MATRIX procedure:							
***** PROCESS Procedure for SPSS Version 4.3.1 *****							
Written by Andrew F. Hayes, Ph.D. www.afhayes.com							
Documentation available in Hayes (2022). www.guilford.com/p/hayes3							

Model	: 4						
Y	: VE						
X	: ISG						
M	: UoG						
Sample	Size: 252						

OUTCOME VARIABLE:							
UoG							
Model Summary							
	R	R-sq	MSE	F	df1	df2	p
	.7830	.6131	.3678	396.1283	1.0000	250.0000	.0000
Model							
	coeff	se	t	p	LLCI	ULCI	
constant	-.1424	.2008	-.7092	.4789	-.5378	.2530	
ISG	.9983	.0502	19.9030	.0000	.8995	1.0971	

OUTCOME VARIABLE:							
VE							
Model Summary							
	R	R-sq	MSE	F	df1	df2	p
	.8583	.7367	.2422	348.4148	2.0000	249.0000	.0000
Model							
	coeff	se	t	p	LLCI	ULCI	
constant	.0211	.1631	.1294	.8971	-.3001	.3423	
ISG	.2826	.0654	4.3195	.0000	.1538	.4115	
UoG	.6578	.0513	12.8166	.0000	.5567	.7588	

***** DIRECT AND INDIRECT EFFECTS OF X ON Y *****							
Direct effect of X on Y							
	Effect	se	t	p	LLCI	ULCI	
	.2826	.0654	4.3195	.0000	.1538	.4115	
Indirect effect(s) of X on Y:							
	Effect	BootSE	BootLLCI	BootULCI			
UoG	.6566	.0697	.5233	.7932			

***** ANALYSIS NOTES AND ERRORS *****							
Level of confidence for all confidence intervals in output:							
95.0000							
Number of bootstrap samples for percentile bootstrap confidence intervals:							
5000							
----- END MATRIX -----							

8.5.5 DS

Run MATRIX procedure:							
***** PROCESS Procedure for SPSS Version 4.3.1 *****							
Written by Andrew F. Hayes, Ph.D. www.afhayes.com							
Documentation available in Hayes (2022). www.guilford.com/p/hayes3							

Model	: 4						
Y	: VE						
X	: DS						
M	: UoG						
Sample							
Size:	252						

OUTCOME VARIABLE:							
UoG							
Model Summary							
	R	R-sq	MSE	F	df1	df2	p
	.6407	.4105	.5603	174.1146	1.0000	250.0000	.0000
Model							
	coeff	se	t	p	LLCI	ULCI	
constant	-.0733	.2958	-.2478	.8045	-.6560	.5093	
DS	.9431	.0715	13.1953	.0000	.8023	1.0838	

OUTCOME VARIABLE:							
VE							
Model Summary							
	R	R-sq	MSE	F	df1	df2	p
	.8567	.7339	.2448	343.3293	2.0000	249.0000	.0000
Model							
	coeff	se	t	p	LLCI	ULCI	
constant	-.1210	.1956	-.6188	.5366	-.5062	.2642	
DS	.2444	.0615	3.9724	.0001	.1232	.3656	
UoG	.7249	.0418	17.3409	.0000	.6426	.8073	
***** DIRECT AND INDIRECT EFFECTS OF X ON Y *****							
Direct effect of X on Y							
	Effect	se	t	p	LLCI	ULCI	
	.2444	.0615	3.9724	.0001	.1232	.3656	
Indirect effect(s) of X on Y:							
	Effect	BootSE	BootLLCI	BootULCI			
UoG	.6837	.0717	.5490	.8239			
***** ANALYSIS NOTES AND ERRORS *****							
Level of confidence for all confidence intervals in output:							
95.0000							
Number of bootstrap samples for percentile bootstrap confidence intervals:							
5000							
----- END MATRIX -----							