

Review Article

Technological Tools for Knowledge Apprehension and Promotion in the Cultural and Heritage Tourism Sector: Systematic Literature Review

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Received 14 September 2022; Revised 11 December 2022; Accepted 16 December 2022; Published 22 December 2022

Academic Editor: Zheng Yan

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One of the objectives sought within the teaching-learning processes is the apprehension of knowledge. In the cultural and heritage tourism sector, these processes are integrated with the help of the Information and Communications Technologies (ICT), such as immersive technologies, to develop new forms of interaction, improve the user experience, disseminate knowledge, and promote these destinations. Given the boom in technological development and its application in tourism, this study is based on analyzing through a systematic literature review the research progress that has been made in this area. The proposed methodology comprises a series of information search and characterization stages in which 54 studies are analyzed. The systematic analysis and breakdown stage highlights the use of gamification and e-Learning as key tools for the apprehension of knowledge in tourism environments, showing its versatility in developing digital tools for different contexts. The results allow proposing a research agenda based on three key components: e-Learning as an instrument of interactive education where technologies are articulated with pedagogical aspects, dynamic marketing, and its replicability in different tourism sectors, as well as the development of advergames and the development of gamification techniques and games from the technological field and its characteristics as an evaluative tool in the field of learning.

1. Introduction

Tourism represents an economic sector that has registered significant growth in recent years. The diversity of destinations has also allowed the development of new ways to encourage and develop tourism, for example, through technology [1].

Smart systems have become a trend that involves technological, economic, and social development [2]. These developments are not only technological but also integrate aspects such as interconnection, synchronization, and concerted use of different tools [3]. In this sense, smart tourism relates the growing dependence of tourism destinations, related sectors, and tourists with information and communi-

cation technologies (ICT) that transform massive amounts of data into value propositions.

Faced with the rise of ICT, the tourism sector has been integrating with the development of mobile applications, platforms, and other digital tools, which allow offering new services and providing enhanced experiences, such as dynamic forms for the dissemination of information [4], digital tools for the promotion of destinations [5], and use of technologies for immersive experiences outside or inside the places to be visited [6]. For example, augmented reality, strategies for knowledge dissemination, and learning processes that enhance the apprehension of knowledge, such as those related to the culture and natural characteristics of the territory [7].

Cultural and heritage tourism had advances in the integration of technologies within its dynamics. Cultural values are of great importance due to the curiosity of tourists to interact with different customs and learn about the historical events of certain regions. Hence, technologies serve to promote these destinations. For example, immersive technologies that allow users to interact from virtuality, either from a remote site or as part of the experience with culture and heritage [8], to establish methods for the conservation of the same places because of their great value or because they have restricted access, allowing a more controlled interaction through technology [9].

Immersive technologies, gamification, and e-Learning are allies in the modernization of the tourism sector because of the features they can offer. For example, the use of games for the transmission of information has become increasingly popular, being implemented as an educational alternative or as a dynamic alternative in the communication of information of interest, so it can be used within tourism as an alternative to apprehend about destinations and their characteristics [10].

Gamification can be used in teaching-learning processes [11, 12], in fields such as education [13, 14], health [15], culture [8], and business and tourism [10]. The use of the gamification approach helps users to learn dynamically. The presence of gamification in tourism is a new way to offer learning, marketing innovation, heritage history, and culture awareness and can enhance an enjoyable and impressive tourism experience that could lead to a high level of travel satisfaction [10].

Now, from the point of view of cultural and heritage tourism, technological integration has meant an advance from innovation, transforming the sector with practices that allow dynamic experiences with the knowledge of the regions and their characteristics, which generally include natural and/or historical aspects [16]. The incursion of technologies, such as geocaching as a tool for training processes and knowledge apprehension [17] or e-Learning used from training in cultural and social knowledge for its use in local tourism [18], are clear references of how technology allows a good integration in natural environments and of cultural importance, creating dynamism in front of the tourist experience.

Given that this type of tourism has a great impact within these processes of technological integration, it is necessary to know the state of research and the different advances that have been achieved in terms of developments focused on natural spaces of tourist vocation, which are largely related to cultural and heritage destinations. In addition, it is important to highlight the role of technologies as tools for the apprehension of knowledge, associating techniques, technologies, and the contexts in which they are developed. The diversity of digital applications and tools that have been developed in recent years, together with the increase in the number of publications on the subject, support the initiative of this study, which aims to understand the relationships, characteristics, and implications in this field of knowledge.

2. Methodology

One of the most common ways to evaluate and understand all available research literature related to a specific research problem or question is the systematic literature review

[19]. For this study, the objective is to recognize the advances within the technological strategies used for the apprehension of knowledge developed in natural environments with a tourist vocation. The search allows us to identify that the tourism sector is one of the sectors that has greater approaches when using technology as a tool for improving experiences and disseminating information, especially natural environments and archaeological and heritage vocation. For this reason, the review is oriented towards this type of specific context, as can be seen in Figure 1, where the methodological scheme will be followed as outlined, taking into account the observations of the PRISMA methodology.

2.1. Stage 1. Search Criteria. A series of questions are proposed to guide the research process. These questions are related to the search for trends in terms of technology and strategies that have been studied in the research area around tourism-oriented natural environments.

Q1: what are the trends in research on technological strategies for knowledge apprehension in tourism-oriented natural environments?

Q2: what strategies are used for knowledge apprehension in tourism-oriented natural environments?

Q3: what type of technology is the most used for knowledge apprehension processes?

Then, the design of a search equation is proposed to explore the different advances in the area of interest. The different searches will be carried out using the Scopus database, which stands out for being a source with access to publications of recognized quality [20].

Initially, a survey on immersive technologies is made. This technology is the most used in projects in natural environments where nature and technological resources are integrated. The following equation was used for this preliminary search.

(Title (“immersive technolog*” or “immersive environment”) or (key (“immersive technolog*” or “immersive environment”)).

This equation yielded a total of 1703 results, including studies from 1993 to August 2022. This initial search is performed on all document types offered by the database. In order to have a more consolidated base that meets the needs of the study, a limitation is made as to the scope of the search.

2.2. Stage 2. Primary Information Search. A new equation is generated with a series of terms that mix technological aspects, selected as the types of technology with a greater appearance in the first search, as well as the integration of natural environments, focusing not only on geological and natural parks but also terms related to tourism and heritage since they represent a category in which these technologies are widely applied. This equation is presented as follows:

Title (“virtual realit*” or “immersive technolog*” or “Augmented reality*” or “immersive environment*” or “Mixed reality” or “Visualization” or “Virtual Worlds” or “e-learning”) and title (“Geopark*” or “Natural Park” or “environmental park” or “National park” or “Geotourism” or “Geoheritage” or “tourism”).

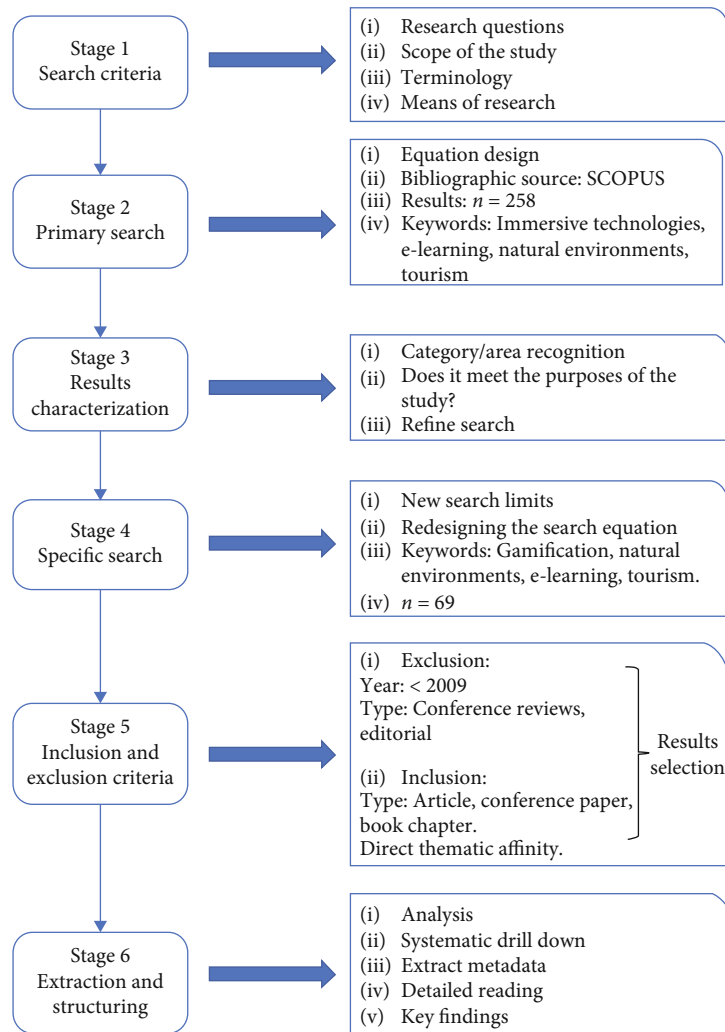


FIGURE 1: Methodology developed for the study.

A total of 258 results are then obtained related to the advances of technologies and their incorporation within scenarios of interaction with people, natural environments, tourism aspects, and approaching knowledge around history and heritage as an integrating component.

2.3. Stage 3. Characterization of Results. A categorization based on the main topics involved is developed concerning the results obtained, and it is defined how they are aligned with the purposes of the study. Although it is clear that immersive technologies had a boom within sectors such as tourism and those aspects of natural environments are integrated, it is necessary to make more specific filters to have information with greater relevance and coherence concerning the topic of interest. Knowledge apprehension strategies are then reviewed from a technological and educational perspective, so the search must be refined.

2.4. Stage 4. Search for Specific Information. The review leads to finding a factor closely related to apprehension strategies such as gamification, which integrates serious games for learning-teaching processes. The games, in this case, take

on the role of the evaluator of knowledge integrated within the experience with technologies, thus being a category of great interest for the present study.

In this way, a more specific information search equation is proposed where gamification, learning processes, and natural environments are integrated, as well as eliminating those terms that do not contribute more results to the search, as shown in the following equation:

Title (“e-learning” or “gamification” or “apprehension” or “learning process”) and title (“Natural Park” or “environmental park” or “National park” or “tourism” or “outdoors” or “outside”).

This search yields 69 results that are the basis for the subsequent analyses to be implemented in the review.

2.5. Stage 5. Determination of Inclusion and Exclusion Criteria. The first review of the set of studies allows us to have a clearer idea of the different approaches and establish a filter that allows us to discard those studies that do not make a significant contribution to the objective of the review. A classification is made based on the reading of

abstracts, giving them a score according to their level of suitability for the study, as is used in some studies [21, 22].

A score of 3 is given to those papers that are more in line with gamification in learning processes, knowledge dissemination, natural environments, and technological integration. A score of 2 is given to those that, although they touch on the subject, do not have direct connotations with the topic, 1 to those with some useful implications in the general topic, and 0 to those that do not contribute something significant to the discussion.

After this review and classification, inclusion and exclusion criteria are established as shown below. The exclusion criteria focus on publications with a publication date before 2009, excluding the types of documents classified as editorial and review of conference or event, and those studies that, in the classification, were evaluated with a score of "0". The inclusion criteria include the studies found with publication dates since 2009, the types of documents defined as articles, conference papers, and book chapters, and the studies classified with a score from 1 to 3.

The following are the exclusions:

- (i) Date of publication prior to 2009
- (ii) Editorial and review of conference or event
- (iii) Results scored "0" in the classification

The following are the inclusions:

- (i) Publication date from 2009 onwards
- (ii) Article, conference paper, and book chapter
- (iii) Results were scored with values between 1 and 3 in the classification

In this way, a final base of 54 results is obtained from which the final analysis is made. 63% of the total of the final results have the highest coherence, with the objective of analysis being those with the highest score and referring to studies on the use of gamification and e-Learning as a tool in aspects of marketing, education, improvement, and evaluation of the experience of tourists.

2.6. Stage 6. Extraction and Structuring. The filtered results analysis is developed to systematically break down concepts and arguments, extract metadata, and manage the information. A detailed reading of the data is made, the information is structured, and trends and key findings are determined. Graphical and statistical tools are used to analyze metadata, establish relationships between results, correlate findings, and analytically describe the results found.

3. Results and Discussion

One aspect to highlight within the analysis is related to the behavior of the research topic within the academic community over the years, in terms of the number of publications, as shown in Figure 2, based on the documents selected in stage 5 of the methodology. It is possible to observe the

behavior of the production, being 2015, the year where such production is boosted, and 2016, the first peak of such academic production. Although there is a subsequent decrease, then there is the highest production peak in 2020. In addition, a growth trend is evident, as can be seen in the dotted line, which is related to the boom in the use of ICT in different aspects of a globalized society.

Now, as part of the analysis of the documents, a reading was made of those studies that have greater affinity with the topic of interest, finding a series of advances in the area of the implementation of technologies as a tool within learning-teaching processes in natural environments related to the tourism sector. Table 1 refers to studies selected in stage 5 of the methodology, as those with greater affinity to the topic of interest and presents a characterization of these, starting from the type of associated technologies, the type of development, the country, and the scenario where it was done and a description of the associated scopes.

Regarding the type of technology, the one that stands out the most is gamification and its techniques as a means used for learning and teaching processes in academic and tourism environments [23]. E-Learning also stands out as a technology used mainly for the education sector for its approach to teaching processes that promotes an improved way for its users to acquire knowledge, which is also used in different sectors [24]. To a lesser extent, there are geovisualization technologies [17], such as the use of maps, geological information graphics, and geodata management that allow better interaction with natural spaces, as well as social networks that integrate an important part within communications and the dynamics of society.

Mobile applications have the greatest participation in the type of development done, integrating different qualities and functions required to create experiences for users. There are also developments in web platforms and modules in the same, which are, to a greater extent, used for e-Learning strategies and teaching processes [25, 26].

Some of these studies are focused on the theoretical advancement of important aspects of teaching processes, technological adoption, and the development of the technologies themselves, so they are not directly applied. In contrast, most of the studies analyzed are developed in some physical location in different countries, generally in European and Asian countries, which have progress within the processes of technological appropriation and tourist destinations in which these types of tools have been applied [27, 28]. In this way, the different scenarios in which these advances are applied are also related, being cultural and heritage tourism as one of the most influential areas in which technologies have been used as allies in the user experience.

Marketing also has a great relevance given the benefits that such technologies have for promoting destinations, products, and services in a more dynamic way [5]. Education, for its part, encloses training in tourism and adds spaces for learning, which allow new ways for the apprehension of knowledge. It can be seen how the areas of these studies are varied, with computer sciences, social sciences, and business and administration being the three areas that have the greatest impact. These areas include technological

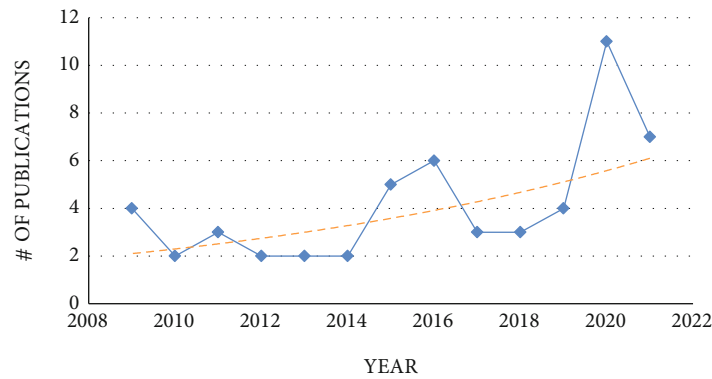


FIGURE 2: Publications per year.

aspects, aspects related to users and their behavior, and aspects related to the economic sectors that can benefit. To a lesser extent, there are also areas such as engineering, environmental sciences, and decision sciences, evidencing the interdisciplinary cut that this topic has by bringing together these areas under multiple application scenarios.

Now, gamification and e-Learning comprise the typologies of technologies, emphasizing the results obtained, and characterized as described in stage 5 of the methodology. Thus, the analysis to be developed focuses on these two typologies and emphasizes the relationships and applications generated within the scenarios in which they are developed, thus having a more detailed characterization of these technologies and their relationship with the apprehension of knowledge.

3.1. Gamification. Gamification techniques are becoming increasingly popular in learning applications through game design elements to help enhance learning in nongame or more serious contexts [42]. Game design techniques combine knowledge, practical and dynamic elements, and methods that promote positive stimulation when playing them, making it easier for that knowledge to be learned and the journey experience more memorable [7]. In addition, the purpose of making educational games can be used as virtual communication between players.

Design elements in gamification include points, levels, badges, leaderboards, prizes and rewards, progress bars, stories, and feedback [43, 44]. Although these elements have been successfully applied to improve end-user engagement, satisfaction, and task performance, effectiveness is often uneven. It is context-dependent and varies by the target audience. Gamification provides engagement, motivation to users [45], increases team competence [46], and can convey information and knowledge with a game-based approach [47, 48].

3.1.1. Education. Gamification has become an ally for the teaching-learning process, being an innovation strategy in education using ICT. One of the factors of greatest interest is the integration of the characteristics of games that allow obtaining greater motivation and incorporation with educational content, so it is possible to speak of a more efficient way of learning when the fun is mixed. The concepts are shown to be more dynamic and interactive for students [49].

From a perspective on the acceptance and inclusion of this type of technology as a strategy for the apprehension of knowledge, studies find that the pleasure when using these games and the social benefits are determinant for students [50]. The above is of vital importance within the design as it aligns with an important factor, which corresponds to the social pressure students have from their peers and the reputation they can give to the game, so their decision is being influenced by this aspect that relates to the content and dynamism of the game in question [37].

Gamification is also used for educational processes in social and cultural environments, for example, in scenarios in which this type of technology is used to share concepts and information dynamically and where users can learn in a fun way, making use of the functions and features that can be applied in the scenario they have, such as cultural tourism [8].

3.1.2. Tourism. Tourism, especially related to culture and heritage, is a sector where there is a greater record of gamification applications as a tool for promoting destinations and their characteristics. In this type of tourism, the user experience is improved through different technologies, which have had a great boom, especially in places of little access, great historical value, and a variety of information to share.

From the user experience, there are advances aimed at providing increasingly specialized information to improve the stay in the chosen destination, recommend plans and services, as well as interact with other users and share information, being this type of services improved with the use of gamification techniques [36]. Other studies focus on user experience by analyzing user responses with technological features within their tourism activities. For example, Kim et al. [23] use gamification to boost aspects of fun, satisfaction, and entertainment within the experience in a park with natural mazes where different clues are hidden and rewards can be obtained by finding them. Such an example shows how to improve user interactions with the services and products offered by engaging users within the established path.

In the tourism sector, the concept of gamification can use augmented reality (AR) [51, 52], geocaching [17], and GPS-based applications. These types of technologies use geolocation data and generate a series of interactions

TABLE 1: Study characterization.

Authors, year	Technology type	Type of development	Description	Country	Scenario
Widarti et al. [7]	Gamification	Mobile application	Development of an exploration game to promote the patrimonial knowledge of a series of temples with the use of mechanisms and game dynamics for the process of knowledge apprehension.	Indonesia	Heritage tourism
Annansingh & Bright [29]	e-Learning	Modules on web platform	Use of e-Learning in the ICT training process for employees of a national natural park and evaluation of its acceptance.	United Kingdom	Employee training
Sigala [30]	e-Learning	Collaborative e-Learning model	Geoportals as e-Learning tools for tourism education integrating geovisualization and geocollaboration.	N/A	Training in tourism
Kidi et al. [8]	Gamification	Mobile application	Design of an educational game focused on providing knowledge on Indonesian culture through a series of gamification techniques.	Indonesia	Culture education
Hoffman [31]	e-Learning	Modules on web platform/3D display	Development of didactic tools in e-Learning 3D exhibition mechanics for use in a technological museum as an educational component for students during their visit.	Czech Republic	Interactive museum
Fermoso et al. [32]	e-Learning	Mobile application	Development of an application to serve as a guide for tourists around cultural heritage and a collaborative e-Learning tool between institutions.	Spain	Cultural tourism
Negrusa et al. [33]	Gamification	Mobile application	Identification of gamification techniques and the use of mobile applications in sustainable tourism.	N/A	Sustainable tourism
Sigala [25]	Gamification	Mobile application	Study on gamification elements that can be integrated into tourism marketing and their effects on tourist behavior.	N/A	Tourism marketing
Királová [4]	Gamification	Mobile application	Analysis of how gamification can be used as a tool in tourism marketing.	N/A	Tourism marketing
Kachniewska [5]	Gamification	Mobile and online application	Application of gamification principles and the connection with social networks as tools for the promotion of tourism through mobile applications in a young population.	Poland	Tourism marketing
Xu et al. [34]	Gamification	Mobile and online application	Gamification as a tool used for tourism marketing and as an option to improve the tourist experience.	China	Tourism marketing and user experience
Mesaros et al. [6]	Gamification	Mobile application with augmented reality	Application development that combines principles of gamification and augmented reality to create a virtual tour of a historical site and learn from it.	Slovakia	Cultural and heritage tourism
Skinner et al. [17]	Gamification	Mobile application with geocaching	Study on the implications of gamification and geocaching as practices with good benefits for the tourism sector, with emphasis on the younger generations.	N/A	User experience
Madlberger et al. [27]	Gamification	Advergame	Analysis on the use of advergames within the promotion of destinations and experiences and on the behavior within the tourism sector.	Austria	Tourism marketing
Lee [35]	Gamification	Mobile application	Use of a gamification application in order to analyze the psychological behavior of users around learning and travel experience.	South Korea	Cultural and heritage tourism
Barreal et al. [26]	Gamification/ e-Learning	Web platform/ simulator	Development of a gamification tool for its integration within the training process of students in the tourism sector, developing a simulation of the context to be applied.	Spain	Training in tourism

TABLE 1: Continued.

Authors, year	Technology type	Type of development	Description	Country	Scenario
Alves et al. [36]	Gamification	GRS model architecture	Development of a model for the improvement of group recommendation systems (GRS) using gamification techniques and intelligent agents in tourism.	N/A	User experience
Aguiar-Castillo et al. [37]	Gamification	Mobile application	Development of an application to study the acceptance of gamification as a complementary learning strategy in face-to-face classes in the educational environment.	Spain	Education
Chan et al. [38]	e-Learning	Web platform/simulator	Use of gamification tools for the development of an e-Learning strategy focused on virtually mediated urban tourism education.	N/A	Training in tourism
Souza et al. [39]	Gamification	Mobile application	Study of gamification as a tool for sustainable tourism as an activity linked to the fulfillment of the SDGs.	N/A	Sustainable tourism
Bao et al. [40]	Gamification	Mobile application	Development of a gamification application aimed at cultural and heritage tourism in order to enhance the experience and learning of associated concepts, through immersive tools.	China	Cultural tourism
Pageh & Permana [18]	e-Learning	Web platform	Use of a collaborative platform of knowledge on aspects of culture and heritage tourism for the training of students in tourism.	Thailand	Cultural and heritage tourism
Bahtiar et al. [41]	Gamification	Mobile application	Development of a gamified mobile application that focuses on the transmission of knowledge and enhances the experience in rural tourism.	Indonesia	Rural tourism
Liberato et al. [28]	Gamification	Mobile application	Proposal of an application with the use of games for the promotion of cultural and heritage knowledge around tourism derived from wine and gastronomy.	Portugal	Cultural tourism
Zorrilla et al. [24]	e-Learning	Modules on web platform	Analysis of the use of gamification tools for e-Learning processes as dynamic alternatives for student training.	N/A	Education
Kim et al. [23]	Gamification	Mobile application	Study of the impact of two gamification functions of an application as a tool for the analysis of the psychological responses of tourists in an open environment (corn maze).	South Korea	User experience

between users and destinations, allowing to merge both skills for activities in open spaces and adventure destinations, as well as users with access to technology, allowing to interact more closely, for example, with younger generations [53]. There is talk of smart tourism in which globalization, connectivity, and virtuality are the trends. However, their implementation is limited by the technological development of the regions, so there is a greater presence of this type of technology in developed urban areas than in rural areas or urban areas with little development [54]. These technologies allow bringing knowledge closer from a more interactive perspective with the territory by having the ability to have “meeting points” with knowledge and thus generate a type of apprehension with the help of gamification functions [17].

There is a contribution in tourism from the economic point of view and concerning the dissemination of knowledge by integrating technologies, achieving approaches to cultural destinations in the form of virtual tours with recreations and/or information points where the user can dynamically encounter knowledge, searching for objects, earning points, touring the space, and learning about the historical values of the place [5, 7]. The interaction with the territory

and its history becomes important within the experience. Hence, applications developed with gamification techniques also gather knowledge of cultural values and expose them so that users learn and feedback the experience [28].

The effect that serious games have on the learning process has been proven, so games have popularity within different tourism and educational projects [35]. In the cultural context, then it supports the integration of the concepts that are wanted to highlight the destination with dynamics that allow associating easier the understanding of these and propitiating the dissemination of cultural and heritage knowledge [34, 40]. In addition, it associates conservation aspects as virtual and recreational dynamics can be generated, with the use of virtual or augmented reality, for example, allowing the history of the place to be known, making it more accessible, and continuing to preserve its integrity [41]. Sustainability concepts are integrated by promoting more environmentally friendly tourism, generating tourism options that reduce travel and waste generation or the direct impact on some natural environments [33], as well as the association of the Sustainable Development Goals as a guide for the promotion of economic development in the region,

promoting interest in environmental aspects, education, and development of the region through innovation [39].

3.1.3. Marketing. Gamification methods can be used as a form of tourism marketing, taking advantage of the benefits of interacting with digital interfaces that integrate ICT [55]. Marketing represents a vitally important aspect for the tourism industry, especially to create a relationship with users and potential tourists, so understanding the behavioral aspects of people and destinations is very important. The use of technologies has meant the integration of new and improved ways to connect users with destinations, as well as to provide them with more interesting options for an increasingly demanding public [4].

Gamification is used, for example, as an instrument that allows knowing the behavior that the tourist has when they interact with this type of technology and checking the positive effects of this during the tourist experience that is related, whether mediated by technologies or virtual. Companies use gamification to promote the acquisition of products or services, user loyalty, brand recognition, and effective engagement. In terms of marketing, being related to persuasion, motivation, and manipulation, there is a great potential for gamification as it integrates these aspects [25]. Advergames are then referred to as the creation of games in order to promote a brand, product, service, or an organization, which, in the case of tourism, can create greater awareness of destinations to visit by promoting them in a more dynamic and fun way [27].

Social networks are also relevant around the dissemination and promotion of the games themselves and the destination directly. In this way, the regions, their attractions, and the tourism promoting organizations are promoted. The game design then must allow the promotional mechanisms to lead to a sociological response that leads users to access the services and/or products that are advertised [5]. It is precisely on this aspect where there is the biggest problem, especially with the new generations that need new systems to capture their attention and promote the acquisition of products. The use of gamification alone does not ensure success in marketing. It is important to know the target audience, the type of product or service to be promoted, and have an appropriate tool design that allows to engage and persuade the public.

It should be emphasized that gamification applied in this type of context requires further research to learn how to design this type of application and tools so that they are well received by users and meet the objectives that are set, in addition to recognizing that technological development has a technical and economic limitation for the regions to be impacted and their sociocultural characteristics.

3.2. E-Learning. E-Learning is a novel way of integrating technology with traditional teaching and learning processes, thus allowing a varied applications within different sectors, being a widely used tool within the training processes for students of careers focused on tourism, as well as for the training of guides and personnel working in tourist areas. Advances in this area allow the development of various

modules that users can access and learn from and collaborate. It is the case of the study done by Pageh and Permana [18], where a series of modules developed in such a way that local wisdom on cultural and historical aspects is integrated in a collaborative way so that students can have access to this knowledge and thus be able to disseminate it from their training in tourism.

Education is also transferred to the users of tourist destinations or institutions such as museums and theme parks, which integrate this type of technology and tools to promote knowledge and evaluate it [31]. It is the case of the study by Feroso et al. [32], where an application is developed that serves as a guide for tourists within cultural heritage destinations and has the particularity of having a collaborative e-Learning structure that allows other institutions to collaborate within the development of content and learning media through mobile applications.

These advances bring dynamism and can motivate students to use them for their education outside the institutions. However, it should be noted that it has been found that these advances do not necessarily favor motivation or encourage the regular study, since other factors must be taken into account, such as the learning styles of students, level of progress in the courses, disposition towards technology, as well as the context [24].

Some examples integrate simulations and recreation of environments and gamification techniques that help with the development within the area in a more dynamic way [29]. The advances between e-Learning and gamification demonstrate knowledge acquisition through game elements, applicable to different topics and scenarios, such as tourism in urban areas and sustainability [38]. The real challenge lies in developing the technical and visual elements, as well as engagement and interaction strategies for users to use, enjoy, and apprehend.

Game elements applied to educational environments need attention, especially to have better designs and content that fit the subjects' needs in educational, evaluative, and cohesive terms with the student and their motivations [26]. This area has many challenges associated with the particularities of the educational systems, the attitudes and aptitudes of students and teachers, and access to technology and technical development to create this type of tool.

4. Research Agenda

The topic of interest of this study allows us to contemplate a research agenda in some aspects highlighted in Figure 3. As can be seen, emphasis is placed on three main focuses: marketing, gamification, and e-Learning. These foci are the topics of the greatest impact found in this study and represent opportunities for further research in these areas. Although gamification and e-Learning as technological alternatives to be applied within the tourism sector are aspects addressed in this study, several factors are relevant to be addressed in-depth in future research to continue progress in this area. On the other hand, marketing is considered a relevant focus since it is one of the applications with the greatest strength and growing trend,

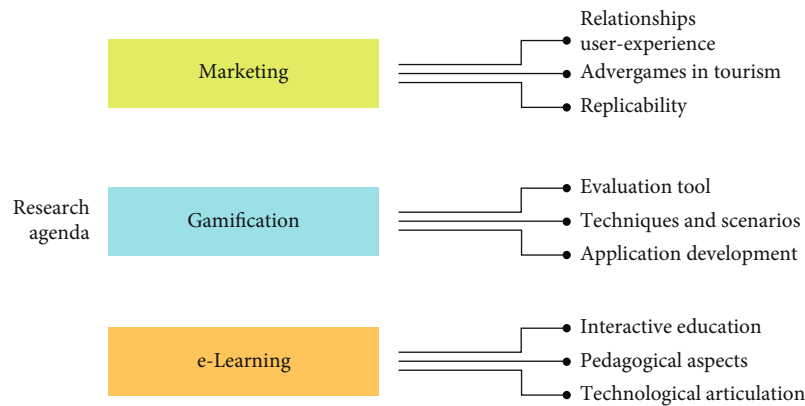


FIGURE 3: Proposed research agenda.

especially because of the opportunities it can represent for the tourism market.

Concerning marketing, it is necessary to make a research effort to understand the relationship between the users of technological tools and the tourism experiences they want to promote through them. This understanding of the relationships between the parties can lead to better solutions from the user's point of view and the point of view of destination promotion. Another trend that needs further development focuses on the development of advergaming as a tool for promoting destinations and experiences with the use of gamification. In addition, the invitation is extended to further research on how gamification advances can be replicated not only in cultural and heritage tourism but also as a promotional alternative in different types of tourism.

Although gamification is the topic of greatest interest in this study, it should be noted that several areas need to be further explored, such as its value as a tool for the evaluation and apprehension of knowledge. These are important aspects of using gamification techniques, such as the development of tools that allow transforming educational aspects through the use of this type of technology that brings the user closer to knowledge and facilitates its understanding. The apprehension of knowledge is then a key part to consider in future studies of gamification as an evaluative tool, precisely because of the characteristics that integrate the games within the learning-teaching process that can be linked in different educational and leisure scenarios.

It is noted that, although there are good results in cultural tourism, it is necessary to study how gamification techniques interact in different scenarios, to study how variables such as the type of audience, age, characteristics of the scenario, access to technology, and among others, are integrated. Incorporating these variables as aspects of being studied in future research will serve to fill the gap in the subject, and that is vital for the proper development of tools and applications. The design of the applications is then a relevant point to articulate the theoretical development with the practical one and, thus, to have more information on the implementation of these technologies in the field of tourism.

Finally, concerning e-Learning as an educational tool, it is proposed to promote studies that emphasize the development of more dynamic and interactive strategies in which

users can learn in a new way. Although technological development is important, the pedagogical aspect cannot be disassociated, so an important part of this agenda is to make technological advances with a strong relationship with pedagogical professionals to study the real effects of this technological integration in education to make the necessary corrections. On the other hand, it is suggested to articulate other types of technologies, such as gamification techniques that have been discussed in this study and evaluate their effectiveness as an agent that benefits the apprehension of knowledge in tourism and training experiences.

5. Limitations

A limitation of the research is that there are few examples of the use of technologies in the tourism sector associated with natural environments. Although cultural tourism is one of the sectors that benefit most from this type of technology, the need for more studies focused on developing strategies focused on this type of tourism leaves a gap in the research that cannot be fully addressed. The present research approaches by extracting information and research results in the area still needs to give a more solid conclusion due to this gap in the research in the area of interest. It is suggested to promote more studies on the subject to continue with this process of knowledge construction.

6. Conclusions

The cultural and heritage tourism sector refers to the branch of tourism that has the greatest relationship with technological advances used to improve experiences, create new forms of immersion with destinations and their characteristics, and disseminate knowledge and promote it.

Gamification and e-Learning are the research trends with the greatest interest in the results obtained, including the development of serious games, gamification techniques within varied scenarios, collaboration with e-Learning within training strategies, and tools for the apprehension of knowledge in the area of tourism.

The development of applications with gamification elements has become a common component within the developments addressed in the studies since they allow the

dissemination of information and promote the acquisition of knowledge in a more dynamic and applicable way to the environments that tourists frequently ask during their trips and/or tourist experiences.

The use of gamification techniques and technological advances has been used to a great extent as a tool within marketing to engage with the public dynamically and innovatively.

Although these new technologies have a positive impact, it cannot be assured that they always promote an improvement in the apprehension of knowledge in any scenario. It is necessary to consider other variables such as technical aspects, access to technology, type of audience, user motivations, and characteristics of the territory.

Conflicts of Interest

The authors declare no conflict of interest.

Acknowledgments

The authors would like to thank the Ministry of Science, Technology, and Innovation of Colombia (Minciencias) for the resources provided to finance the project: Integral proposal for the apprehension of the knowledge of the natural and cultural diversity of the natural parks of Colombia based on their relevance as UNESCO Geoparks, through the use of immersive technologies for the generation of creative contents, and from which this work is derived. We would also like to thank the higher education institutions that participated in this project.

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