

Smart technologies in tourism: a study using systematic review and grounded theory

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Abstract - Tourism that uses smart technology and practices to boost resource management and sustainability while growing their businesses' overall competitiveness is known as smart tourism. Information and communication technologies (ICTs) have had a profound impact on the tourism industry, and they continue to be the key drivers of tourism innovation. ICTs have fundamentally changed the way tourism products are developed, presented, and offered, according to the literature. Any empirical studies or experiments must be focused on accepted or formed hypotheses. In this regard, grounded theory measures were used for interpretation, while a systematic review was performed to assess the research scope from current studies and works. The main goal of the study is to investigate and propose long-lasting and stable smart technologies for implementing smart tourism. Grounded theory is a concept that uses methodical rules to gather and dissect data in order to construct an unbiased theory. Fewer studies on smart technology in tourism have been conducted, with a majority of them concentrating on IoT, virtual and augmented reality, big data, cloud computing, and mobile applications. In either case, there is space for further investigation into this important field of study. As a result, this paper is a vital first step toward a clearer understanding of how smart technology can be applied to the tourism industry. The number of available research work on smart technologies in tourism were fewer from the selected journals and conference proceedings, which led to the accessibility of lesser data for analysis.

Keywords - IoT, smart technology, smart tourism, systematic review, tourism

I. INTRODUCTION

The tourism industry has been significantly affected by information and communication technologies (ICTs), and they continue to be the primary drivers of tourism innovation. Literature shows that information and communication technologies (ICTs) have radically changed the way tourism products are made, viewed, and offered [1]. The tourism industry's technical impact affects not only the manufacturers, but also the customers. The advancement of ICTs has explicitly denoted improvements in tourists' attitudes, which is central to the entire discipline of ICTs adoption in tourism. Clearly, ICTs' enormous popularity is shaping tourists' attitudes towards mobile apps, thus improving users' experiences [2]. Indeed, the broad reach of ICTs' involvement in tourism has sparked considerable debate among academics. It is also claimed that the internet has influenced the transformation of best operations and strategic practices in the tourism industry

[3]. Certainly, this is because the internet facilitates access to information to every corner of the globe. It is inevitable to admit that the application of ICTs in tourism is an important component in the supply chain [4].

Smart tourism is defined by a particular destination, attraction or tourist itself, depending on its technological abilities. Increased use of smart technology in their operations, from payment methods to interactive activities, is modernized in many destinations. Smart tourism ultimately aims to increase resource management efficiency and maximize competition [5]. Smart Tourism's European capital defines a clever destination as: "A destination that facilitates access to products, services, spaces and experiences from the tourism and hospitality sector via ICT instruments. It's a healthy social and cultural environment that is based on the social and human capital of the city. It also implements innovative, smart solutions and promotes the development and connectivity of companies."

It is explained in [2] in further detail: 'Smart Tourism Destinations take advantage of: (1) Technology embedded environments; (2) Responsive processes at micro and macro levels (3) End-user devices in multiple touch-points; and (4) Engaged stakeholders that use the platform dynamically as a neural system.'

Taking into account the available literature at the time of writing, researchers have provided their own definition of smart tourism as below.

'Smart tourism is the act of tourism agents utilizing smart technologies and practices to enhance resource management and sustainability, whilst increasing the businesses overall competitiveness'.

With various types of ICTs being created on a daily basis, the world continues to go digital. These ICTs use powerful operating systems like iOS12, Android, and others that are now common on modern mobile technologies. Indeed, getting access to mobile web or "apps" opens up a slew of new possibilities [6]. The notion that innovations are becoming smarter and use of wearable devices has recently emerged in academic discourse and within the tourism industry. Wearable technical technologies are expected to have a huge impact on people's interactions with their environments, despite their youth [7]. However, there is a scarcity of studies on the use of smart technologies in tourism in academic literature. As a result, this paper provides an interesting opportunity to further research on the use of smart technologies in tourism.

II. RESEARCH METHODOLOGY

Any research or scientific study must be conducted based on acceptable or formed theories. In that sense, grounded theory steps have been followed for the analysis

purposes; while the systematic review has been done to reach the research scope from the existing studies and works. The major objective of this study is to explore and recommend long-lasting and secure smart technologies to introduce to smart tourism. Grounded theory is a common philosophy with methodical rules for collecting and dissecting data to create an impartial theory [8]; while, a systematic review is a process of gathering and summarizing similar studies, which are conducted in the past to form a new conclusion and suggestions for the upcoming research work [9]. There were fewer researches conducted on smart technologies in tourism; those were mainly focused on IoT, virtual & augmented reality, big data, cloud computing, and smartphone applications.

The required pieces of information and data were collected from previous studies and qualitative research methods were used to analyze the gathered data. This study uses the grounded theory technique as the study uses qualitative data. Qualitative research methods use participant's experience, behaviors, and perception for data analyzing purposes [10]. A five-step process was introduced (Table I) to do a systematic review that used grounded theory for the content analysis [11].

TABLE I. FIVE STEP GROUNDED THEORY METHOD - SYSTEMATIC REVIEW

Steps	Process
Define	Defining inclusion/ exclusion criteria, field of research, select the source for the paper, and keywords for searching.
Search	Papers searched published after 2015, also previous published papers also included for the methodology part.
Select	Papers selected using the critical appraisal skills program (CASP) were used.
Analyze	Qualitative analysis performed
Present	Most suitable smart technologies found

According to the Table II, research papers and book chapters published after 2015 were searched in the initial stage. Furthermore, among the downloaded papers, only peer-reviewed journals and international conferences were included. Although, among these papers, research publications related to smart technologies in tourism were relatively very less. Therefore, some papers related to smart cities were also included in this study. Furthermore, papers related to ICT in tourism also were reviewed. In addition to that, search keywords were included; not only Scopus, emerald, IEEE, springer, and Google scholar to find the full articles published in a high indexed database; but also, smart tourism, smart technologies, IoT, cloud computing, and big data were included. According to the protocol of this study, research articles were shortlisted based on the paper's title and abstract, and Boolean operators were also used to get better results from the search. Finally, all the selected research works were validated based on the CASP tool, which uses the validity of the selected research articles [12]. At last 28 papers were selected based on these criteria and processes, which were closely related to Smart Technologies and Tourism.

Grounded theory was used to perform a different type of coding analysis, and qualitative analysis was performed using the Nvivo software tool [13].

TABLE II. NUMBER OF FINALIZED RESEARCH PAPERS

Database	No of Selected Papers
EBSCO	3
Google Scholar	12
Science Direct	6
Emerald	4
Springer	6
Tylor & Francis	3
IEEE	11



Fig. 1: Literature search overview

Thus, based on the 28 finalized papers, the most suitable smart technology was suggested for future smart tourism according to government support, data security, and cost-effectiveness.

III. EXISTING WORK

IoT enabled devices gather data from the tourist using sensors and store them in cloud storage, which then suggests to the tourist, in the future, about food preferences, near places, restaurants, and hotels; these services reduce extra hours spent by tourists for searching [14]. Meanwhile, collected data using IoT sensors changes to Big data which then can be used to predict tourist demand, enabling better decision-making, managing knowledge flows and interaction with customers, and providing the best service in a more efficient and effective way [15]. IoT and cloud computing are the essential core parts of developing Smart tourism, in the meantime, human capital, leadership, social capital, and innovation also support the Smart tourism destination [16]. [1-3] in line with the following work and further this study has used a network analysis approach to find how ICT supports smart tourism [17]. The researchers explored the fact that tourism focusing on smartphone technologies is the major sign that tourism industries expect from smart tourism; further, smart tourism promotes the implementation of IoT, cloud computing, and wireless communication technologies [18]. Furthermore, a team of researchers, proposed a tourism planner application with the help of IoT and big data, that not only helps the typical tourist but also persons with physical impairments [19]. Similarly, authors pointed out that tourists are expecting flexible and mobile-friendly tourism which can be easily provided by IoT [20]. Meanwhile, a team of researchers developed a system to transform Indian tourism digitally with the help of embedded systems and IoT; where this system assisted users to get to know the authentic history, heritage, culture and tradition of India via smartphone [21].

The authors pointed out that Big data which have been collected via IoT devices can be used to analyze tourism data. Data is collected in three different stages of tourism before, during the tour, and after the travel, based on the analysis results tourists can make their tour user friendly in real-time [22]. Furthermore, another research work pointed out that Smart tourism is not only about applying applications of different techniques but is also about easy and accurate accessibility of required tourism information before, during, and after the tour for the tourist use; but all these can be made possible with the help of Big data [23]. Meanwhile, a study about how smart technologies assist the marketing of tourism, shows how big data helps to track and forecast tourist flow and categorize tourists from the data of hotels and smart system management [24]. an IoT application based on smart city has been proposed, that confirmed the tourists save more than 50% of their time, while their satisfaction level is around 27% [25]. Closely, another study revealed that IoT in tourism can help enable automatic hotel check-ins and check-outs, locate travel destinations, and monitor tourist's health, which lead to cost reduction, better productivity, and traveler's satisfaction. But, there are challenges such as data security, investment cost, and technology infrastructure in implementing IoT on tourism [26].

A researcher pointed out that any internet connected wearable device can help the tourist by providing information, communication, sharing experiences, revealing setbacks encountered when traveling.; Furthermore, these devices can be accessible with voice command to avail help from tourist guides [27]. Similarly, a team has developed a prototype based on augmented reality (AR) using image processing and location data, which helps improve smart tourism by recommending scenic places, restaurants, hotels, and other important matters to the tourist [28].

Researchers stated that the Koran Tourism Organization, Tourism virtual reality (VR) mapping, and location-based tourist services provide required tourism information to the tourist, where these data can be collected from social media updates of tourists who have already visited those places; This information can help increase tourist visits by suggesting better places, food preferences, and hotel selections via web platforms or mobile applications [29]. In another study, Researchers proved that the websites, social media, and smartphone provide a huge support for tourism in terms of travel planning, which promotes both explorative and exploitative use but tourist's data security and privacy of data have a negative effect [30]. Likewise, Mobile technologies can help to implement VR in tourism, which is used to see the attractiveness of certain places in 3D shapes before tourists visit those places physically. Furthermore, they mentioned that the data privacy and security must be considered [31]. Meanwhile, the utilitarian and hedonic characteristics of mobile technologies are the main reasons for successful adoption of mobile technologies for travel; where these technologies provide greater assistance to the tourist before, during and after the travel for information accessibility [32].

The authors identified four-factors but ICT provision was not included, which doesn't mean that ICT is unimportant, but the knowledge deficiency of visitors to local conditions and characteristics caused a simple smart city structure that creates smart tourism [33]. But, in the

next research work, a group of authors mentioned that the internet penetration rates and the rate of use of Information and communication technology, existing smart city infrastructure and social networking create a way for the smart tourism destination. In the; meantime, policymakers must consider economic, social, environmental, and technological strategies to support smart tourism [13]. Rosanna Leung has conducted a survey among selected hoteliers in Taiwan, that confirmed the fact that hoteliers must be aware of the necessity of smart technology in terms of how social media and ICT promote hotel industries among tourists.; Furthermore, they believe technologies cannot replace employees, but that can help increase employee performance [34].

Authors state that technological implementation on tourism introduced smart tourism that supports tourists to make their travel easy throughout the entire tour where the Ambient Intelligence tourism is driven by a collection of disruptive technologies, and on the other hand, these technologies have many negative influences, especially on data privacy & security [35]. Similarly, a researcher mentions that the current tourism sector heavily depends on innovations like smart technologies, although the tourist's satisfaction is not only dependent on the technological factors that make the tourism accessible but also on services; some services can be provided only by humans [36]. But, an investigation revealed that the smart technologies play a major role in tourism to convert visited places into memorable ones via smart technologies tools and media [37].

Researchers proposed a model called Smart Tourism Destination (STD) based on the Delphi technique, which explored the fact that Smart Technologies alone are not enough to create smart tourism, but governance of STD is also needed [38]. Meanwhile, authors explain that ICT can frustrate tourists for authenticity, anxiety, addiction, narcissism, and mindlessness. On the other hand, it can help the tourist to avoid being alone during travel by providing virtual friends via smartphones [39].

Authors found that smart information systems, intelligent tourism management, smart sightseeing, ecommerce systems, smart safety, intelligent traffic, smart forecasting and virtual tourist attractions are tourists' key evaluation factors of smart tourism attractions, these factors help real-time data access, online booking, tourist flow forecast, better transport, and smart safety during the trip [40].

IV. DISCUSSION AND CONCLUSION

There were many research works conducted around the globe on the topic of tourism, and all the studies focused on finding and filling the gap in the tourism industry by providing ease, memorability, reduced costs, time management, and finding the places. In that sense, digital experts work on making smart tourism, especially on implementing smart technologies in tourism. Smart tourism has a difficult and dynamic environment where both physical and technological components are mixed and developed as a single object [41].

Nowadays, tourists expect to make their travel easy by finding high-rated restaurants to stay in, locate exact places to reach on time, cost-effective transport, fast and easy information access, secure information storage, and virtual travel to the tourism spots around the world before they

start their tour. Tourists prefer to visit a place if the accessibility of the required information is developed in a proper digitalized way [42]. On the other hand, tourism industries focus not only on profit but also on traveler's satisfaction by meeting traveler's expectations, and these expectations can be met easily by implementing smart technologies. The role of smart tourism is to provide a hedonic, noble, and significant experience [43].

From atheoretical perspective, this research work provides a meaningful contribution to tourism development using smart technologies. The main objective of this study is to review existing smart technologies in tourism and suggest the most suitable technology to improve the smart tourism industry for a better travel experience. A comprehensive systematic literature review was conducted to reveal various aspects of smart technologies in tourism and find the secure, quickest, and safest smart technologies to develop tourism using smart technologies. According to the review, this paper proposes a way to improve tourism using smart technologies by considering the facts selected from previous studies. Furthermore, this paper will help policymakers to make-up their concept of tourism in terms of smart technologies.

This study provides a solution to the gap that exists between smart technologies and tourism in terms of research areas. Findings of this study helps developers to use the suitable smart concept when designing new applications for tourism industries and tourists, which reduces the development time and cost. Furthermore, this work helps academics, researchers, and students to engage with better tourism studies in the future. The specialty of the used grounded theory strategy in the extraction of scientific classes suggest a helpful exploration technique for decision-makers. Likewise, it permits scientists to direct an examination that is interpretive and grounded in information.

Smart tourism is one of the most wanted research areas among academics and researchers and is the future of tourism. But there are only a few studies conducted so far, especially on smart technologies in tourism. Therefore, a detailed systematic review was conducted to earn the knowledge base study on smart technologies in tourism. The grounded theory method was used to analyze the data from the systematically reviewed articles and uncover the social processes. Smart tourism has to be developed more but the concept of smart development was developed as expected [44].

In various researches, authors suggest using IoT, big data and cloud computing technologies to implement smart tourism. Meanwhile, tourists expect user-friendly smartphone applications to access real-time information before, during, and after the tour at any time and from anywhere. But both tourism industrialists and travelers seriously consider data privacy and security, as all the collected data is stored in the cloud for analyzing purposes. Researchers suggested creating internet-connected wearable devices that can provide the required information from the cloud devices. Also, researchers mention that VR and AR devices could be developed to help show the scenic and tourist places before starting the tour. Further, mobile phone applications can be developed to access hotels and restaurants. On the other hand, smart technologies alone cannot make travel easy but human interaction must be mixed with them to develop a better smart tourism.

The findings of this study provide assistance to the academics, researchers, and industrialists to work on further effective implementations on research and development works on smart tourism as this article explored the existing smart technologies engaged with tourism. Based on this study, there are many technologies that can be adopted with tourism, for it to become smart tourism. Among these technologies, IoT was the most recommended and used smart concept to the tourism industry by many researchers and developers, which enabled automation. Travelers prefer real-time and trustworthy tourism information accessibility at any time and from anywhere. IoT can help monitor remotely, manage and control devices from anywhere anytime, and allow massive information access in real-time [45]. Therefore, cloud computing and big data are the most advanced technologies available today to securely store and analyze data collected through IoT devices. These information help tourists in better decision making; to plan their travel, but, the data privacy of users is questionable, although data hiding techniques such as encryption methods help keep user information secure.

There are many types of research conducted on smart tourism and smart technologies, but fewer researchers focused on smart technologies in tourism and fewer statistical analysis was done among the tourist and tourist industrialists about smart tourism, also fewer implementations were developed, but these researches do not completely express about the stakeholder's expectations. It is strongly recommended to conduct survey analysis from the perspective of the stakeholders of smart tourism, and then designers and developers can implement stakeholder's expectations either as a wearable device or as a smartphone application or both.

Other than the above, smart technologies only are not enough but other digital techniques and methods can be implemented with tourism industries such as STD. Also, it is very important to consider a tourist's mind for authenticity for anxiety, addiction, narcissism, and mindlessness while developing smart tourism.

V. RECOMMENDATIONS AND LIMITATIONS

The aim of this research was to look at how smart technology devices are used in the tourism industry. According to proof, the use of smart technology is revolutionizing the tourism industry, resulting in added value for both suppliers and customers. Smart Technology has moved the internet from mobile cyberspace to wearables on the body. Without participating in any physical activity, tourists can use this technology to obtain required information, communicate, share experiences, solve a variety of travel-related problems, and co-create their own value. According to the report, smart technology will turn tourists into explorers. Tourists will undoubtedly be inspired to re-construct their memories as a result of Smart Technology, which will enable them to add time, place, context, and personalization to their offers and experiences. This means that tourists can use only a voice command to program a series of events or actions for a specific period of time and at a specific venue, without the need for assistance from a tourism provider. The advent of smart technology has ushered in a new age of disintermediation, with visitors gaining influence over the entire service delivery process. As a result, the new face of

tourism will be focused on the optimization of "personalized reconstructed experiences" by customers. Smart products open up a wide variety of potential applications for the tourism industry, from both the supplier and customer viewpoints. Tourism providers, on the other hand, must take advantage of the interactivity, intimacy, and ubiquity of wearable devices by looking for ways to provide visitors with personalized, enhanced, automated, and novel experiences. The most critical considerations are privacy and protection of users. The use of smart technologies in tourism poses significant privacy and safety issues. The hotel's data portal, for example, is accessible to tourists who can "voice order" check-in and access up-to-date information about their accounts at the hotel. As a result, they could be enticed to gain unauthorized access to the establishment's data in order to satisfy their curiosity.

In terms of strategic advice, smart technologies are rapidly evolving technologies that will continue to have a direct effect on visitors and tourism organizations. With the Internet of Things, tourism providers should begin to streamline their existing business models and strategies in order to benchmark with rivals and address the challenges that will be faced in meeting the demands of visitors. While this paper makes a contribution by highlighting the use of smart technology in tourism and their future potential, it has some flaws. To begin with, the literature on smart technology and tourism is still in its infancy. As a result, the majority of the references in this paper about the use of smart technology in tourism were minimal academic sources. In either case, there is scope for further inquiry into this significant field of research. As a result, this paper is a significant first step toward a deeper understanding of how smart technology can be used in tourism. Further research into the value development of smart technology in tourism is recommended. It is also proposed that a thorough investigation be conducted to determine the economic implications of smart technology in this industry.

Further, the number of available research works on smart technologies in tourism were fewer from the selected journals and conference proceedings, which led to the accessibility of lesser data for analysis.

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