Smart Tourism Destination in Smart Cities Paradigm: A Model for Antalya

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1 Introduction

Emerging technologies influence tourism destinations and cause new challenges arising from changes in both consumers and the environment. The use of technology in a destination can enrich tourist experiences and enhance destination competitiveness as well as enable new distribution channels and create a new business environment [1, 2]. Technology provides interconnection of services as well as supplying information for planning, organizing, and evaluating data. Therefore, technology has emerged as the driving and fundamental force for tourism destinations. Tourism industry is one of the first service industries to adapt and use information and communication technologies (ICT) for promoting its services [2]. However, tourism is not a clear-cut sector but an all-embracing and pervasive domain of service and industrial activities ([3], 2001, p. 5). Tourism services are mostly interconnected and include a wide range of inputs and outputs in tourism destinations. Technology has started to play an important role to interconnect touristic services. As a result, the digital technology has become an important element for the promotion and distribution of tourism's services [4].

In order to deal with these challenges, first destinations have to recognize the kind of changes that occurred and proactively respond to the changes [1]. Implementing technological tools within tourism destinations has become critical since the connected, better informed, and engaged tourists are dynamically interacting with the destination [5]. UNESCO and WTO have certainly indicated that countries need

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to respond to new tourists' demands, and this response can be achieved by using innovative techniques offered by digitalization or new technology [6].

Tourists have different needs, expectations, and characteristics, and they prefer different types of tourism. Tourism destination covers interconnected services and tangible and intangible products and services. Smart tourism destination is a new but rapidly developing concept which needs considerable attention. This paper seeks to clarify the conceptualization of smart tourism destination and its link with the smart city concept as well as proposing a model for the smart city case study here in Antalya.

2 Smartness, Smart City, and Smart Tourism Destination

The notion of smartness finds its origin in the 1990s, although it proliferated significantly after 2008 [7]. Initially, the concept was coined as a complex technological infrastructure, embedded within urban areas to foster economic, social, and environmental prosperity [8]. More specifically, it posited the integration of ICT to improve processes and interconnect sub-systems [9] to ultimately tackle the economic, social, and environmental challenges imposed by urbanism [10]. Urbanism and managing big cities have enabled the smart city concept. A smart city is a city that uses advanced information and communication technology (ICT) to optimize resource production and consumption [11]. The concept of the smart city represents an environment where technology is embedded within the city. This technology will synergize with city's social components in order to improve citizens' quality of life, while also improving city services efficiencies such as optimizing the use of energy and better traffic monitoring [12]. The ultimate goal of smart places is to enhance the quality of life of all stakeholders, including residents and tourists [10].

Smartness is centered on a user perspective, which makes it more user-friendly than intelligent [1]. The term has been added to cities (smart city) to describe efforts aimed at using technologies innovatively to achieve resource optimization, effective and fair governance, sustainability, and quality of life [13]. The concept of the smart city represents an environment where technology is embedded within the city. This technology synergizes with city's social components in order to improve citizens' quality of life while also improving city services efficiencies, such as optimizing the use of energy and better traffic monitoring [1]. In connection with physical infrastructure (smart home, smart factory), the focus is on blurring the lines between the physical and the digital and on fostering technology integration. Added to technologies (smartphone, smart card, smart TV, etc.), it describes multifunctionality and high levels of connectivity. In addition, a smart city uses digital technologies to enhance performance and well-being, reduce costs and resource consumption, and engage more effectively and actively with its citizens.

Analyzing the concept of smart city, Cohen [14] defined the Smart City Wheel dimensions as (1) smart governance that relates with aspect of transparency with

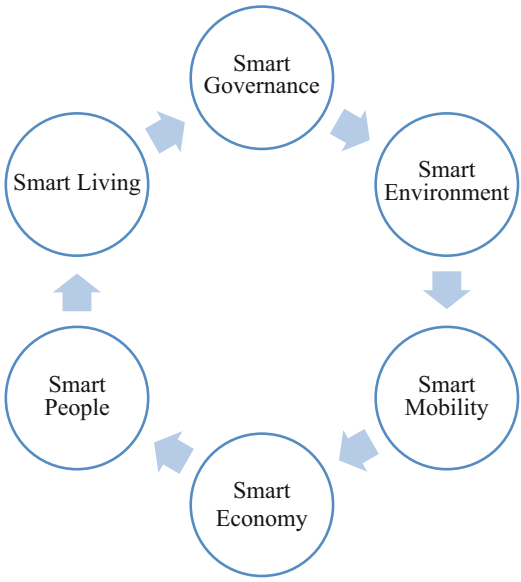

Fig. 1 [!b] Cohen's (2012) Smart City Wheel [14]

governance systems through modernization of city administration by supporting data openness and public involvement; (2) smart environment which is related to energy optimization that leads to sustainable management of available resources; (3) smart mobility which referred to accessibility within the city as well as outside the city and availability of modern transportation systems; (4) smart economy which is related to implementation of economic strategies based around digital technology; (5) smart people which linked to the qualification level of city's human capital; and (6) smart living which involves the quality of life which is measured in terms of healthy environment, social cohesion, tourist attraction, and availability of cultural and educational services (Fig. 1).

Smart city intertwines many entities to each other and therefore needs coordination, information, and infrastructure. Komninos et al. [15] indicate the base of the smart city as human capital, infrastructure/infostructure, and information. A well-structured smart city design is expected to support smart tourism destination as infrastructure and operation planning in the Internet of Things (IoT) era.

Smart city applications of the IoT involve large-scale deployments of wireless sensor networks (WSNs) which have gained lots of research attention in recent times. The SmartSantander project in Spain is an example of one such city-scale research project involving the deployment of over 3000 sensor and relay nodes within the city, supporting multiple applications [16]. Environmental monitoring, outdoor parking area management, and park and garden irrigation are some of the many use cases being tested on the IoT test-bed deployed in the city. The Santander project and other such smart city projects (F. Al-Turjman, et al., [17]) have provided a platform for researchers to experiment with the routing protocols, network coding schemes, and data mining techniques in a large-scale, multiuser application platform

for sensor networks. The sensor network has to deal with large amounts of data, support requests from multiple users, and support information extraction from the network rather than serving as point-to-point communication network and transmit data from multiple information sources to the sink. Such a framework supports different types of users as the IoT user base, including individual users, private data centers, and government agencies. These users interact with the sensor network through an Internet-based interface access network, which is perceived to be an information-centric network (ICN) in the future [18–22]. Data gathered from the sensor network is delivered to the interface access network through gateway nodes. These gateway nodes could either communicate directly with the sink node of the sensor network or could be distributed throughout the network to provide multiple access points. Currently, the experiments are focused on enabling each application as a separate entity. However, in the real world, many of the applications run simultaneously, and the network receives requests from multiple end users in IoT user base at the same time. For example, in a smart city application, the same infrastructure (sensor and relay nodes) that is used in periodic monitoring of traffic intensity is also used for outdoor parking area management and to provide information about traffic congested areas to users on demand. It can even be used to send out high-priority alerts about hazardous road conditions or accidents to users. The information generated by each of these request types has different attributes associated with it. While the periodic monitoring information needs to be reliable, it does not have a strict upper bound on the time taken to gather and deliver the data, as long as it happens before the end of the stipulated time period. However, for on-demand requests generated by the user, such as a user requesting to know the availability of a free parking space in a region, the information has to be delivered quickly (low latency) to the user. In case of emergency alerts, the information must be transmitted reliably and as quickly as possible, to all users in the area. This shows that the sensor network must be able to segregate the requests and manage the heterogeneous traffic flows in a way that satisfies the end user in terms of the perceived quality of information for each request type. Latency, reliability, accuracy, relevance, and robustness are some of the attributes that collectively provide an estimate of the quality of information (QoI) perceived by the user [18–22]. To enable such QoI-aware data delivery, the use of artificial intelligence (AI)/cognition approaches in the underlying sensor network is recommended [23–25] – [18–22]. Cognition refers to the ability to be aware of the environment, in addition to be able to learn from the past actions and use it in making future decisions that benefit the network [23–25] – [18–22]).

Smart tourism destination initiates back to the developments in technology starting with digitalization. Digitalization in tourism has initiated since the 1950s as being parallel to the advances in technology. Broadly speaking, digital tourism is concerned with the use of digital technologies to enhance the tourist experience before, during, and after the tourist activity [26]. Lopez de Avila [27] defines smart tourism destination as an innovative tourist destination, built on an infrastructure of state-of-the-art technology guaranteeing the sustainable development of tourist areas, accessible to everyone, which facilitates the visitor's interaction with and

integration into his or her surroundings, increasing the quality of the experience at the destination and improves residents' quality of life.

Digital tourism focuses on a wide variety of tourist activities in destinations, e.g., museums, transportation systems, concerts, activities, rallies, countrysides, zoos, theme parks, etc. [4]. Tourism apps, events information, accommodation reservation platforms, tourist card, online tickets, integration of cards, and platforms with other services are some components of smart tourism initiatives. Younger tourists and tourists with higher incomes tend to use e-services more intensively [28]. In this regard, digitalization, namely, e-tourism, provides some advantages like the reduction of seasonality, the more successful communication with the customers, and the rise in reservations and sales in general ([29], p. 336).

In addition to the rapid developments in digitalization, tourism services still experience very relevant changes [30], due to the unprecedented development of information and communication technology (ICT) in recent decades [28]. ICTs create value-added experiences for tourists [1] and new opportunities for marketing and distribution strategies for tourism providers [28]. From the supply of products to information search process and consumption patterns, tourism experiences and their preparations can be progressively transformed by advances in ICT [31]. In regard to smart tourism destination, smart city concept is required to be considered as many applications either coincide or complete each other. Both smart tourism destination and smart city concepts aim to achieve a better service for tourists and local people by providing fast, reliable, and rich information and practices.

Basing on the smart city concept, smart tourism destination contributes to the value creation through collecting, sharing, and organizing data supported by the smart city infrastructure. This infrastructure resembles an ecosystem in which stakeholders interact with each other continuously. Therefore, the ecosystem approach has been recognized as suitable to address the topics of smart cities and smart tourism destinations methodologically [11, 13, 32]. The ecosystem in the smart tourism destination provides tourists with real-time and personal services and simultaneously collects data for the optimization of their strategic and operational management [11, 13, 33]. From the smart destination (SD) logic perspective, an ecosystem has been outlined as a relatively self-contained, self-adjusting system of resource-integrating actors connected through shared institutional logics and mutual value creation through voluntary service exchange ([34], p. 15). In this respect, the tourist can collect information, before, during, and after the visit [35]. Also, developments in geographical information systems (GIS) have created new opportunities for tourism marketing and promotion [36]. 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 ([1], p. 557).

Smart cities can be stated as the seed of smart destinations. However, there are important differences between the terms:

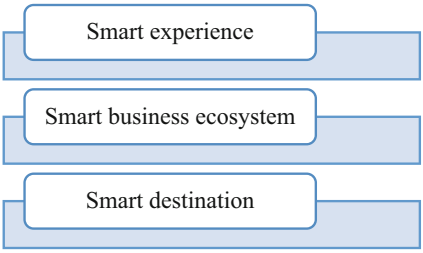

Fig. 2 Smart tourism components

- The main target audience of a smart destination is the tourist not so much the locals. In essence, smart cities and smart destinations share infrastructure as well as facilities while providing solutions to locals and tourists. Therefore, multilingualism, cultural differences, culinary uses, the seasonality of the visiting population, etc. should be taken into consideration [37].
- A smart destination is driven by the tourism sector and public as well as private institutions. Its governance is shared through the formation of inclusive entities such as boards, trusts, foundations, etc.
- Smart destinations are bound to the increase in their competitiveness and to the improvement of the tourist experience.

Smart tourism has three basic components such as smart experience, smart business ecosystem, and smart destination. The smart experience component specifically focuses on technology-mediated tourism experiences and their enhancement through personalization, context awareness, and real-time monitoring Buhalis and Amaranggana (2014). In a smart tourism ecosystem, any type of stakeholder can become a producer, consumer, intermediary, etc. depending on resources and connections rather than predefined roles [11, 13]. Enabling tourism destination managers to understand the importance of integrating smartness for value co-creation can enhance competitiveness ([5], p. 109) (Fig. 2).

Furthermore, smart tourism destinations can be structured as having six A's as (1) attractions which can be natural such as mountain, artificial such as amusement parks, or cultural such as a music festival; (2) accessibility which refers to the entire transportation system within the destination that comprises of available routes, existing terminals, and adequate public transportations; (3) amenities which characterize all services facilitating a convenient stay, namely, accommodation, gastronomy, and leisure activities; (4) available packages which refer to the availability of service bundles by intermediaries to direct tourists' attention to certain unique features of a respective destination; (5) activities which refer to all available activities at the destination which mainly trigger tourists to visit the destination; and (6) ancillary services which are those daily use services which are not primarily aimed for tourists such as bank, postal service, and hospital [38]. Destinations need to interconnect all their stakeholders to facilitate a dynamic co-creation process to increase destination competitiveness [39]. Smart tourism destination may cover the

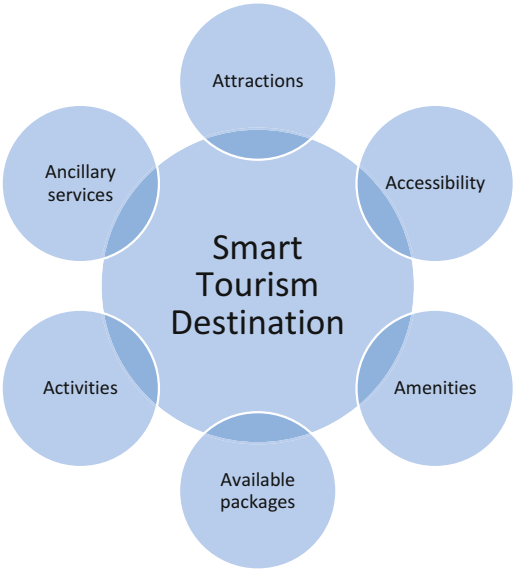

Fig. 3 6 A's of smart tourism destination

following applications appropriate for the six A's before, during, and after the visit of the tourist (Fig. 3).

3 Smart Tourism Destination Instruments and Platforms

The instruments and platforms required to develop a smart tourist destination include the following: [6]

1. *ICT*: The key aspect of smart destinations is the integration of ICTs into physical infrastructure [1]. ICT could contribute in terms of generating value-added experiences for tourists, while also improving efficiency and supporting process automation for the related organizations (11, 13], p. 180). One of the basic changes of digital tourism is the opportunity it creates for tourists to design their own tours and seek out destinations, hotels, flights, etc. upon their individual preferences through Internet access. According to the "World Travel Trends – 2016" report, the Internet is far and away the best tool in travel searching [40]. Tourists browse the Internet to collect traveling information and visit related tourism destination's website which becomes a very useful tool to promote tourism by giving important information for visitors [4]. With 60% of leisure and 41% of business travelers making their travel arrangements via the Internet [41], the Internet has become one of the most important communication tools for tourists as well as tourism providers [42]. Da Costa Liberato et al. [6] claim that

travel trends over the next few years will be determined by the intensive use of the Internet.

2. *Cloud computing*: The use of cloud computing could reduce fixed costs and shift them into variable costs based on the necessities. It also stimulates information sharing that is fundamental to undertake smart destinations.
3. *Internet of Things (IoT)*: IoT is a network that connects anything in anytime and anyplace in order to identify, locate, manage, and monitor smart objects [43]. The recent technological development, however, has enabled the rise of Internet of Things paradigm, in which devices are connected to the Internet, currently allowing 1.6 billion people to have constant access to information [44]. The IoT is a combination of people, processes, data, and everything that makes networks more relevant and valuable than ever before, turning information into actions that create new resources, richer experiences, and unprecedented economic opportunities for companies, individuals, and countries [6]. The IoT could support smart destinations in terms of providing information and analysis as well as automation and control. The process of applying IoT to tourism has to undergo several stages, namely, tourism infrastructure construction, tourism information data construction, and tourism service platform construction. Ultimately, the unified information platform, which will support tourism operation monitoring and automated management, is created [45]. The basic idea of the IoT is the pervasive presence around us of a variety of objects such as radio-frequency identification (RFID) tags, sensors, actuators, mobile devices, etc. which are able to interact with each other and cooperate with their neighboring objects to achieve common goals [46].
4. *End-user Internet service systems*: It refers to a number of applicants at various levels supported by a combination of cloud computing and IoT [6]. End-user Internet service systems include the websites and social media platforms. The websites of tourism destinations grant detailed information about tourism products and services of the location, reduction in dependence to agents, ability to compare alternative products and services during decision-making phase, making reservations directly, and buying the product or service individually [47]. The well-known and most visited destinations have an official website. Table 1 shows the official websites of some of the destinations. These official websites provide some information about services provided in the destinations such as café and restaurants, accommodation, transportation, events, nightlife, what to visit, etc.

Secondly, social media plays an important role in decision-making process [48]. A research conducted with travelers from the USA, Australia, the UK, and Canada implies that 36% of tourists use social media and blog sites, while 54% of them use travel review sites [48]. In 2017, 58.2% of American travelers used user-generated content, and 54.6% used social media in the travel planning process. Fifty-two percent of Facebook users said friends' photos affected their travel plans [49]. Besides Facebook, TripAdvisor, YouTube, Twitter, and LinkedIn are also used by tourists [40]. Carter [49] asserts that 29% of travelers use Facebook, 14%

Table 1 Official websites of destinations

Destinations	Websites
Barcelona	http://www.barcelonaturisme.com/
Madrid	http://www.esmadrid.com/
Stockholm	http://www.visitstockholm.com/
Rome	http://www.turismoroma.it/
Sydney	https://www.sydney.com/
London	https://www.visitlondon.com/
Paris	https://en.parisinfo.com/
Berlin	https://www.visitberlin.de/en

use TripAdvisor, and 6% use Twitter before the travel planning. Social media is used not only before vacation but also during and post vacation. Especially before and during the trip, they rely on mobile technologies to simplify the travel by searching for information about transportation, accommodation, attractions, and activities [50]. Seventy-two percent of people share post-vacation photos on social media, and 70% update their Facebook status while they are still on vacation. In the post-vacation process, 76% post their vacation photos on social media, 55% like Facebook pages specific to a vacation, and 46% post hotel reviews [49]. As a result, tourism providers concern social media significantly through different channels. Mistilis and Gretzel [51] stress that 50% of Australian tourism providers use social media.

5. *Mobile apps*: Tourists get access to end-user Internet service systems through their mobile devices such as smartphones and tablets besides their computers or the available computers they may use. The accessibility of easy-to-carry devices like these allows for the easy purchase of goods and services via mobile devices instead of through more conventional means [6]. Due to the widespread use of the Internet, mobile devices have also become a phenomenon [52]. Furthermore, smartphones have brought many changes to the tourism industry [53]. Multiple studies showed that an increasing number of consumers are booking travel arrangements on their mobile phones – a number that has been increasing steadily for the past six quarters. The travel industry, specifically, boasts over 50% growth year-over-year in mobile [54]. In the USA, almost 40% of tourists access travel information, while 25% book their trips using smartphones [53]. Sorrels [55] claims that 37% of consumers make shopping for flights and 43% make a booking via smartphones. In 2017, 58.9% of American travelers used a mobile phone to access travel info. The digital travel sales are expected to reach 140 billion dollars by 2018 [56]. Mobile apps provide several benefits to tourist. First, some websites are not suitable for mobile using, and mobile apps can overcome this problem. The menus of smartphone applications contain panoramas, videos, interpretation manuscripts, background music, narration, games, AR-based path finding, and SNS connection services (e.g., Facebook, Twitter, KakaoTalk) [57]. Additionally, it can be personalized for each tourist. Secondly, tourists can access restaurants, transportations, local activities, etc. using it. Mobile apps allow the

tourist to reach information [58] and to purchase products and services [53] without the need of a web browser. Therefore, tourists can plan their travels or make room reservations through mobile apps [6]. According to TripAdvisor, 60% of smartphone users have downloaded travel apps, and 45% plan to use the apps for travel planning. Furthermore, 55% of travel apps are purchased within 3 days of travel or while travelers are at the destination. It shows the importance of mobile apps in the tourism industry. Thus, some destinations have launched their mobile applications to customers [53]. Singapore, Korea, London, and Brisbane are among the destinations that offer mobile applications ([11, 13, 45, 58, 59]). Moreover, some hotel chains, luxury resorts, and 5-star hotels have also launched their mobile applications to customers [50, 53]. Tourists could make a room reservation and access the guest loyalty program using the mobile app [53].

6. *Mobile payment*: Smart tourism is not only about being on the Internet or using mobile apps but also using other digital resources such as mobile payment that is receiving growing interest globally as an alternative to using cash, check, or credit cards [60]. Peng et al. [61] describe the mobile payment the use of a mobile device to conduct a tourism payment transaction in which money or funds are transferred from a payer to a receiver via an intermediary or directly, without an intermediary in the tourist destination. The tourists make mobile payments using mobile wallet which comprises of mobile phone with consumer-specific information that allows guest to make payment [6] via various wireless technologies [60] such as near field communication (NFC), radio-frequency identification (RFID), and unstructured supplementary service data (USSD) [6]. Mistilis and Gretzel's [51] study shows that 70% of tourism providers operating in Australia offered online/mobile payment facilities.
7. *Virtual/augmented reality*: It is a computer-generated three-dimensional environment that allows users to view, interact, and manifest their presence in a non-real environment. Depending on the interactivity provided, it may be immersive (e.g., using a helmet) or non-immersive (e.g., using monitors). Given the great potential of this technology in many areas, especially in tourism, there has been a widespread proliferation of mobile applications (apps) with augmented reality. These are used in museums, monuments, galleries, open spaces, and other tourist attractions where objects can be enhanced and supplemented, in real time, with a variety of information (text, images, three-dimensional animation, audio, or video) [6]. Augmented reality (AR) can be described as a combination of technologies that enable real-time mixing of computer-generated content with live video display. In other words, AR allows the physical world to be enriched digitally. AR augments user's view and transforms it with the technologic devices such as a computer, mobile phones, etc. [62]. Thus, the user can view the real world augmented with additional 3D graphics layered to his/her field of vision [63]. So, AR increases the user's reality perception and surrounding environment perception [62]. Lancaster, Vienna, Basel, Belgium, and London are some of the examples to mobile tourist guide applications [62, 64, 65].
8. *Artificial intelligence (AI) and cognition in smart cities*: Various artificial intelligence (AI) techniques have been applied to WSNs in smart cities to improve

their performance and achieve specific goals. We look at AI techniques as a means of introducing learning in the WSN. Learning is an important element in the observe, analyze, decide, and act (OADA) cognition loop [12, 66], used to implement the idea of cognitive wireless networks [67]. In fact, we can classify AI techniques into computational intelligence (CI) techniques, reinforcement learning (RL) techniques, cognitive sensor networks, multi-agent systems (MAS), and context-aware computing. Although these techniques are closely related with each other, we segregate them to show the different goals that learning can achieve for the network as follows.

3.1 Computational Intelligence

CI techniques are a set of nature-inspired computation methodologies that help in solving complex problems that are usually difficult to fully formulate using simple mathematical models. Examples of CI techniques include genetic algorithms, neural networks, fuzzy logic, simulated annealing, artificial immune systems, swarm intelligence, and evolutionary computation. In a learning environment, CI techniques are useful when the learning agent cannot accurately sense the state of its environment. However, a major drawback of this methodology is that it can be computationally intense and may require some form of model-based off-line learning to deliver to the requirements of the application scenario. Techniques such as ant colony optimization, for example, can cause an undesirable increase in communication overhead in the smart city WSNs too [23–25].

3.2 Machine Learning

Machine learning can be classified into supervised, unsupervised, and reinforcement learning. Supervised learning would be more compute intensive and requires a training sequence. Additionally, accuracy of the learning algorithm would then be defined by this training sequence. In the unsupervised learning approach, the learning is from the environment being observed, and no training sequence is required. Reinforcement learning (RL) is a reward-based technique that emphasizes on learning while interacting with the environment, without relying on explicit supervision or complete model of the environment. It is a method of automating goal-directed learning and decision-making. In smart cities' WSNs, RL has been successfully applied in networking tasks such as adaptive routing, identifying low cost and energy-balanced data delivery paths [68], and in information processing tasks involving data aggregation and inference [69].

3.3 Cognitive Networks and Multi-agent Systems

Cognitive networks are built around the idea of having sensor networks evolve around user requirements. It is about taking a step toward developing intelligent networks that do not limit themselves to point-to-point communication within the network. Instead, they enable the network to perceive user requirements and deliver data using distributed intelligence in the network. To implement distributed intelligence in smart cities, the multi-agent systems (MAS) are typically used. The agents in these MAS are called cognitive agents. They may interact to achieve information fusion and retrieval and may also be able to predict data for future use.

3.4 Context-Aware Computing

In large-scale WSNs such as those in smart cities' applications, a huge amount of data is generated. In order to derive useful information from raw data, context of the data plays an important part. Context awareness is even more important in the IoT era, as it enables the network to deliver relevant, user-requested data. While doing so, network resources are also conserved by extracting only meaningful information that is relevant to the requests, from the network. There are various aspects to context-aware computing. They are context acquiring, context modeling, context reasoning, and context distribution [70]. Context awareness is very important and valuable in IoT-based smart cities' applications, as it can add value to the large amount of data available from these applications [23–25].

4 The STD Framework

The case study approach is regarded to be appropriate in this study since it includes the analysis of reports, studies, news, articles, and other text-sensitive documentation and provides a comprehensive coverage of information. According to Simon et al. [71], the case study is a focusing approach that allows the discovery of a variety of interactive processes and the factors involved in an in-depth study of a destination. It is a flexible process, taking into account unexpected issues that may arise or which a participant deems important.

The case study as a research method can include various techniques. Among primary research, the most frequently used methods are observation and interviews [71]. The case study method is, therefore, appropriate to achieve the objectives of the study since it includes the analysis of reports, studies, news, articles, and other text-sensitive documentation and provides a comprehensive coverage of information. In-depth interviews are also made with officers who are in charge of promotion

of Antalya (Ministry of Culture and Tourism) and smart city project (Antalya Municipality).

The study consists of three stages:

1. A comprehensive literature review of smart technology which could be applied for tourism
2. Determining the current applications in Antalya tourism destination
3. Proposing a model for Antalya to be a smart tourism destination

4.1 Antalya as an STD

Antalya, an important destination of the Turkish tourism industry, is located in the Southern Mediterranean of Turkey. Antalya has been very popular as tourism destination because of its clean beaches, sea, Mediterranean climate, and high number of historical and natural sights. In addition, one of the main characteristics of the region is having new, high quality, and a high number of accommodation facilities compared to competitor countries and regions. As of 2018, Antalya as a tourism destination has 590.000-bed capacity [72].

Smart tourism destination is a new concept for Antalya, and it is mainly attached to "smart city" applications. In the first months of 2015, the Metropolitan Municipality of Antalya announced that it started a project to become a smart city in tourism, transportation, health, security, and municipal services. In addition, it was announced that free Internet, electronic traffic control system, smart public transportation system, intelligent tourism points, intelligent health service, unobstructed SMS system, intelligent environment, and smart energy systems would be established within the scope of the project ([73], p. 158). The current state of Antalya in the context of smart tourism can be summarized as follows in Table 2.

4.2 An STD Model for Antalya

The smart tourism process can be examined in three phases, namely, before the vacation, during the vacation, and post-vacation. In before-the-vacation phase, tourists try to get information about the destination and try to plan their vacation. Mostly they start by visiting the website of the planned destination and the travel blog sites. In this respect, smartphone applications can also be considered as an efficient tool because it enables tourists to find information anywhere and anytime in accordance with where the users are and what situation is through the latest technology, including applications, augmented reality (AG), and location-based service (LBS) [58]. The social media can also affect the tourists' decision where a destination to be visited has not yet been decided at this stage. The attractive or interesting photos about a destination shared by the service providers or tourists'

Table 2 A summary of Antalya city STD

	Website	App	AR	Virtual tour
Antalya	www.antalyadestination.com www.visitantalya.com www.visit-antalya.com www.antalyatourguide.org www.antalyakulturturizm.gov.tr www.antalya.gov.tr www.antalya.bel.tr www.antalyamiz.com www.antalyatourguide.com	Antalya Travel Guide and Offline City Street Map/Antalyakart/ ICF Airport mobile app	Antalya Travel Guide and Offline City Street Map	antalyacentral.com/ Ministry of Culture and Tourism/ mekan360.com
Kemer	www.visitkemer.com	Kemer Travel Guide		
Manavgat	www.visitmanavgatside.com	–		
Side	www.visitmanavgatside.com	Antalya Travel Guide and Offline City Street Map		Ministry of Culture and Tourism
Belek	www.visitbelek.com	–		
Serik		Serik Tourism Guide		
Demre	hometurkey.com	–		Ministry of Culture and Tourism

friends on social media can attract tourists' attention to the destination. When the destination to be visited is decided, tourists search available hotels operating in the destination using travel blogs or social media, and finally, they make hotel booking via the hotel or travel agency websites. Tourists can also make hotel booking via hotels' social media accounts. Due to the technologic development, nowadays some hotel and travel companies provide booking service via their mobile apps. Thus, tourists can prefer hotel and travel booking using their mobile apps.

In during-the-vacation phase, tourists are expected to have a high level of satisfaction from their vacations; this could be supported by supplying them easy access to information as well as high-quality and fast information. This section covers the transportation, sightseeing, accommodation, dining, shopping, and all other facilities demanded by a tourist. As an example, some hotels allow tourists keyless room entering via mobile apps. Free applications provide information about the museums, restaurants, café-bar, etc. located at the destination. Thus, tourists can make a tour plan or make a sightseeing using the mobile apps. During the sightseeing, they can take photos and can share them on their social media accounts by mentioning the destination or the hotel.

In the post-vacation phase, tourists can share photos related to their vacations. They can also share thoughts about the destination or hotel on travel blogs. Post-vacation stage is crucial since the tourists may decide to revisit and share their impressions for the destination. Table 3 shows the model for Antalya as a smart tourism destination.

Table 3 A model for Antalya as a STD

	Before vacation	During vacation	Post-vacation
Smart tourism office	Antalya website (1)		
Hotel management		Digital accommodation (2)	
Smart tourism office		Hotel receptions (3)	
Smart tourism office			Follow-up messages (4)
Smart tourism office			
Smart tourism office		Mobile app for Antalya (5)	
Antalya Municipality		Antalya transportation app for tourists (6)	
Ministry of Culture and Tourism		Digital tourist kiosks (7)	
Smart tourism office	IoT (8)	IoT	IoT
Antalya Municipality		Free Wi-Fi hotspots (9)	
Smart tourism office	Social media (10)	Social media	Social media
Smart tourism office		QR codes (11)	
Smart tourism office		Virtual reality (12)	
Smart tourism office	Artificial intelligence (13)	Artificial intelligence	Artificial intelligence
Smart tourism office		Smart tourism kiosks (14)	
Smart tourism office	Design your stay in Antalya (15)		Share your stay in Antalya (16)
Smart tourism office	Social media (17)	Social media (17)	Social media (17)
Smart tourism Office	Bloggers (18)	Bloggers (18)	Bloggers (18)

1. Antalya website: websites for Kemer, Side, Manavgat, Alanya, Kundu, etc. combined with Antalya website
2. Digital accommodation: hotels offering digital services like hotel apps and mobile payment
3. Augmented reality: virtual augmented reality corners for tourists to see a short vision for historical sites
4. Follow-up messages: asking for a rating for vacation and asking the intend to visit again by a message to phone or e-mail
5. Mobile app for Antalya: instant mobile app access for every tourist arriving at Antalya airport, covering information related to transportation, climate, sites, etc.
6. Antalya transportation app for tourists in different languages
7. Digital tourist boxes: offices offering information, augmented reality, and all kinds of tourist information
8. IoT: Shopping, dining, social media, advertisement, etc.
9. More free Wi-Fi hotspots in Antalya
10. Social media accounts of the smart tourism office in Antalya
11. QR codes in several historical, natural sites, city center, etc.
12. Virtual reality for historical sites
13. Artificial intelligence
14. Smart tourism kiosks
15–16. Websites for Antalya
17. Social media accounts
18. Bloggers for Antalya

5 Concluding Remarks

The study proposes a model for Antalya as a smart tourism destination. The linkage between one tourism product and another at destination level is vital because of the nature of tourism industry which are combinations of multiple components served in several touch points that are perceived by the customer prior, during, and after their trip [74]. Therefore, the model needs to be organized, coordinated, and controlled by a "smart tourism office" to be established by a group of experts from tourism sector, university, engineers, municipality, and government.

The model focuses on attempts to be made before, during, and after vacation for a tourist. The main goal is to provide a higher-quality tourist experience by providing a fast, easy, and high-quality access to services, tourist attractions, gastronomy, accommodation, transportation, etc. For this purpose, in the "before vacation" stage, tourists need proper information through websites, apps, IoT, social media, design your vacation site, and bloggers. For the time being, Antalya has many websites which may cause a confusion for potential tourists. During vacation stage, tourists need to plan their stay as well as having a good organization, joy, and satisfaction which can be achieved by digital accommodations, apps, smart transportation, kiosks, QR codes, virtual reality, IoT, and artificial intelligence. After vacation stage requires follow-up messages, IoT, and social media.

The main benefit of the model would be to provide tourists to get fast, reliable, easy information which would increase the quality of their tourism experience. Today, tourism industry is subject to the technological transformation that can make the conducting of business easier and faster and the transmission of information more convenient [6]. The model would enable tourists access to services, touristic attractions, shops, transportation, local food, hospitals, etc. easily and safely.

Secondly, smart tourism applications like augmented reality and apps may increase the positive impression of the tourists for the tourism destination as they may get interesting information which may create excitement and pleasure. Next, they may help other travelers in their decision-making process, revive and reinforce their travel experiences, as well as construct their self-image and status on social networks ([11, 13], p. 181). This would increase the destination's image and would attract more tourists to the destination.

Tourism revenue, has a contribution of 3.1% to Turkish GDP in 2017, which influences its impact and importance for the economy. There seems to be many applications and practices of ICT to be adapted for tourism. Tourism industry can be one of the driving forces of modern economies as it is a leader user of ICT [6]. Tourism industry is expected to grow vastly in Turkey and influence the ICT sector positively.

Finally, there needs to be a council, board, or an office to coordinate the smart tourism destination network which would follow all kinds of steps, applications, practices, etc. Becoming a smart tourism destination requires leadership, vision, patience, strategic management, and continuous evaluation and change. Perceiving the smart tourism destination as an ecosystem is essential, and a vision and

a clear set of goals for innovation are key facilitators for developing smart tourism destinations as a collective whole ([5], p. 119). In addition, smart tourism applications require a continuous follow-up for 24 h. For this purpose, the smart tourism destination council can be formed by a group of engineers, tourism experts, municipality officers, etc. Public-private partnership (PPP) is essential when running a smart tourism destination initiative. Enhancing collective intelligence is essential in smart tourism destinations ([5], p. 118).

Another fact to consider is the "smart city" and smart tourism destination link. Smart city infrastructure and applications interact with smart tourism destinations. Therefore, smart tourism destination would promote and improve fastly in case of smart city practices. Smart tourism destinations should also perform smartness by implementing appropriate tourism applications within smart cities' components as defined by [14]. To take full advantage of the current possibilities provided by smartness, destination managers have to integrate the entire range of smartness components and ensure interoperability and interconnectivity of both soft and hard smartness ([5], p. 120). Also, smart tourism destinations need to emphasize ways to enhance the tourist experience, while simultaneously improving the quality of life for residents.

Local and foreign tourists need information about how to use and access to smart tourism destination network and content. It is recommended that destinations not only focus on exploiting the use of new technology but also educate the citizens and visitors on how to best use this new technology.

Finally, to survive, traditional tourism firms have to redefine their business model and the way they propose to create customer value ([11, 13], p. 183). Smart tourism destination can be an important tool for creating customer value by taking the advantage of technology.

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