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Smart Tourism City: Developments and Transformations

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Abstract: Cities and tourism entities invest massive resources into smart system initiatives as information technologies are a key factor for a city's destination competitiveness. Moreover cities around the world are increasingly recognizing the smart tourism city concept and related strategies as means of optimizing sustainable environments. Particularly for cities facing emerging issues of residents' negative perceptions towards tourism, smart tourism city empowers a city to rise to this challenge by creating urban spaces that residents and visitors can enjoy together. However, smart tourism city research initiatives still fail to address the full spectrum of related and potential developments. This study presents a conceptual approach to defining smart tourism city: the smart city and its components are defined and contrasted with smart tourism and its components. The resulting convergence—smart tourism city—is then examined in light of a number of pioneering examples of smart tourism cities and its vital roles in the age of sustainable development. The main purpose of this study is to show the interests of locals and tourists context and the roles of 'smart' government leadership to researchers and practitioners.

Keywords: smart tourism city; smart tourism; smart city; sustainable development; COVID-19

1. Introduction

The heyday of information communication technologies (ICT) arising out of the digital and computer revolution have transformed entire market systems, moving them toward greater diversity and vigor. ICT's role is steeply imperative, given the pervasiveness of smartphones and related technology convergence in every field. ICT becomes progressively more ubiquitous because of its 'anytime anywhere' accessibility. Presently, ICTs have been reaching their pinnacle with the advent of the fourth industrial revolution and the proliferation of the Internet of Things (IoT).

ICTs, including IoT-enabled devices and sensors are changing our daily life as they also play a significant role in urban development, such as resource utilization, economy and sustainable development. The acceleration of urbanization causes population concentrations, poor environments and severe challenges to the cities that will be met with increasingly sophisticated smart systems. Cities find out about solutions to urbanization by being coupled with smart technology and building smart cities. The word 'smart' refers to "technological, economic and social developments enriched by ICT revolutions that bank on sensors, data, new ways of connectivity and exchange of information" [1]. Forward-thinking cities are making significant investments in the design and development of these smart cities (initially called digital cities and intelligent cities). With the tremendous innovation in existing information technology, cities are finally able to create more connected and intelligent designs. A smart city is thereby defined as a high-tech, intensively connected city that uses advanced new

technologies to create a sustainable metropolis, innovative commerce and enriched quality of life for its citizens [2].

From the industrial and public sector perspectives, the most important benefit associated with advanced technology is the exponential increase in information, which interacts with the biologic world on a daily basis and enables the industry to predict consumers' cultural interests [3]. A smart city also focuses on social and cultural life and it may enhance urban social interactions [4]. Given that tourism is highly related to cultural phenomena [5], the notion of 'smart' has been adapted to the context of tourism. As a new buzzword, 'smart technology' has been significantly changing the way visitors think about browsing websites; smart phones and mobile applications are exploited for making various travel decisions, such as those pertaining to transportation, accommodation and activities available at a desired tourism destination [5]. Tourism activities based on smart technology, smart tourism, is a social phenomenon arising from the incorporation of ICT with the tourism experience [6]. The smart tourism experience represents technology-mediated experiences that combine personalization, context-awareness, and real-time monitoring [7].

The fourth industrial revolution has bolstered development in every industry including tourism; the tourism industry as many cities that tap into tourism competitiveness bank on smart city infrastructures and focus on enhancing the city's competitiveness. Examining the smart city phenomenon in the tourism context is crucial, particularly regarding its influence on the travel experience and tourists' decision-making process. Besides economic benefits, the tourism industry also affects the destination city's society and cultural environment [8] and the residents' perceptions of tourism affect the destination city's enthusiasm towards tourism business. Popular tourism destination cities face environmental damage and residents' complaints caused by tourist overcrowding. Moreover a correlation between sustainable urban development and residents' happiness is proven as a significant factor for the urban sustainability [9]. Accordingly, stakeholders in the tourism industry regard the smart tourism city, convergence of smart city and smart tourism, as an important means to enhance the quality of life of visitors and residents alike. Smart tourism cities are willing to invest massive resources to implement and sustain smart tourism systems that work to solve over-tourism problems, protect citizens, and offer a better living environment [10]. In this context, a smart tourism city is an innovative tourist destination that guarantees sustainable development that facilitates [11] and enhances visitors' interaction with experiences at the destination and eventually improves the residents' quality of life.

However with technology being embedded within the cities environment, the smart tourism city concept represents new challenges to enhance their sustainability, smart tourism city research still fails to fully cover smart tourism city developments and their current status. The aim of this study is to provide definitional clarity and comprehensive approach to the anatomy of smart tourism city as a convergence of a smart city and smart tourism: which elements are critical for the development of a smart tourism city. This study presents insights regarding smart tourism cities' roles in sustainable development. It is therefore the ultimate aim of this study to provoke researchers in associated fields and inspire practitioners to perform smart tourism city practice.

2. Convergence of Smart City and Smart Tourism

2.1. Smart City

With acceleration of urbanization, a number of cities face challenges to design and develop a better city for living. Urban communities endeavor to mitigate urbanization challenges and ensure a quality living environment through more efficient asset and resource management. As ICTs have a central role to play in the quest for industry development, cities find out about solutions to urbanization by being coupled with technology. Many city governments are seeking to infuse technology into every aspect of city operation to create more connected and intelligent designs. A smart city, new approaches to urban planning and living, is a high-tech, intensively connected city that uses advanced new smart technologies [12] to create a greener metropolis, innovative commerce, and enriched quality of life for

its citizens [2]. Smart city ideas absorbed urban policies such as digital city, green city, knowledge city, therefore it is a complex approach and requires long-term perspectives. Smart city is also referred to as an intelligent city as the information flow is analyzed and translated throughout the IT, social and business infrastructures to enhance the intelligence of the city [13]. As a part of information flow, it is essential to collect citizen's opinions about live-ability in cities and create the public value [14]. Cardullo and Kitchin [15] highlighted the 'citizen-centric' measuring citizen inclusion, participation and empowerment in smart city initiatives in Dublin, Ireland. The result shows that how stewardship, civic paternalism, and a neoliberal conception of citizenship, source of 'citizen-centric', prioritizes consumption choice and individual autonomy within a framework of state.

The concept of the smart city is to optimize infrastructures in order to ideally ensure quality of citizens' life [2]: transportation, water and power supply, waste management, IT connectivity, efficient urban mobility, e-governance and citizen participation. Therefore, the factors defining the smart city were identified as hard and soft domains, including eight areas of sub-domains, such as mobility, building, health care, entertainment, education, public safety, environment and economy [12,16]; six key domains, including governance, economy, environment, mobility, living and people [17]; four pillars of key components, including energy, environment, industry, living and service [18]. An integrated model is shown in Figure 1, below.

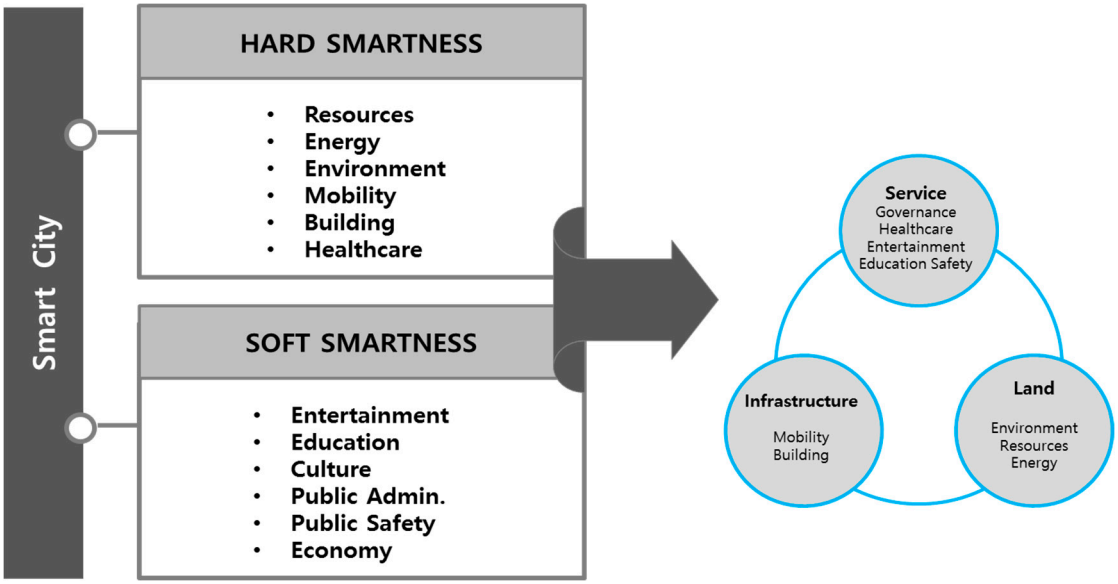

Figure 1. Components of a smart city.

Figure 1 illustrates three main domains of the smart city: service, infrastructure and land, with their corresponding sub-domains. The service domain covers health care, entertainment, education, safety and quality of life in the urban space. Cultural heritage management and human capital management are also included [12]. The infrastructure domain includes transport and mobility features, such as city logistics, info mobility and people mobility, which concerns ICT utilization for intelligent transportation products and management. The land domain involves urban infrastructure, which refers to the interactive management of building services and housing quality with ICT. Social issues that address the digital divide, social relations and ICT connectivity [19] are addressed with other challenges from the perspective of e-governance [20].

The design of a smart city depends on various local context factors, including geographic location and population density [12]. Each city has its own priorities regarding the sectors in which to develop smart tourism initiatives. In 2014, Singapore started making an extensive effort to build a smart nation program by collecting data on urban daily life. Based on its findings, the government is now deploying systems that monitor the city's crowdedness, cleanliness of public spaces and traffic flow.

The collected data are incorporated into an online platform called "Virtual Singapore," which works to inform government policy and potential disaster risk management. It also informs the decision-making processes of residents and private enterprises by managing data in real time. In Dubai, the government launched the "Smart Dubai Initiative," created 22 government entities, and developed 50 smart services for functions related to electric bills, vehicle registration, locations of ATMs, reporting violations, tracking visa status and monitoring taxi services. The Seoul Metropolitan Government has spent the past three years developing an advanced IoT ecosystem with interlinked smart devices. The city government recently announced another five-year (2018–2022) urban plan which includes 14 public services in five areas, with a budget of $108 million. In 2015, Estonia government also launched the world's first crowdfunding initiative designed to develop a smart city to create new green technologies. This initiative raised 40% of the total required amount within three days.

The participation and cooperation of governments, implementing businesses and the public are vital in smart cities. Especially governments must understand the elements of a smart city and carry out roles as an ecosystem builder, strategic planner, policymaker and investor.

2.2. Smart Tourism

Tourism is a social, cultural and economic phenomenon that involves the movement of people to places outside their usual environment for personal or professional purposes [5], and the main purpose of traveling is for cultural immersion. The beginning of the 1990s cultural tourism became one of the alternative forms of tourism, opposed to mass tourism [21]. Tourists demonstrate a proactive approach and create experiences actively while traveling. Thus, tourists' heterogeneous preferences have been drawing attention from destinations and the destination cities endeavor to provide customized high-quality travel experiences. Ever since the Internet is influence the distribution of tourism information and sales, tourism industry is seeking for successful e-tourism strategies by developing Web sites, electronic commerce and related governance [22]. And now cities are aggressively pushing the new tourism agenda forward with the tremendous development of smart technology.

Smart tourism represents the convergence of ICT and tourism and denotes the transformation of tourism through technology. It indicates a new tourism braced by integrated efforts at a destination to collect and analyze data extracted from diverse sources in combination with the use of advanced information technologies to transform travel experiences to make them more enriched, efficient and sustainable [1]. In this regards smart tourism is a social phenomenon arising from the incorporation of ICT with the tourism experience [6]. Moreover, smart technology has been significantly changing the way visitors make diverse travels decisions, such as those pertaining to transportation, accommodation and activities available at a desired tourism destination [5]. Smart tourism identifies three travel phases: pre-travel, travel and post-travel [7] wherein tourists' expectations and behavior may change. During the pre-travel (planning) phase, tourists decide where to go, how to get there, and where to stay. During the travel (onsite) phase, tourists decide where and what to eat or what activities to engage in. During the post-travel (evaluation) phase, tourists express varying degrees of satisfaction which they share in travel reviews. Further advanced smart devices enable tourists to obtain real-time travel-related information and enhance visitors' ability to acquire information [23]. Accordingly, tourists take more initiative in creating customized travel experiences [24]. The smart experience refers to technology-mediated tourism experiences and their enrichment via personalization, uniqueness and real-time monitoring [7]. The smart experience refers to technology-mediated tourism experiences and their enrichment via personalization, uniqueness, and real-time monitoring [7]; the overall experience has progressed from e-tourism (managing data) to smart tourism (maximizing interest).

Wang, Xiang and Fesenmaier [25] identified increase in tourists' creativity through applications such as the camera and more flexibility in the travel activities which are more personally tailored. Li, Hu, Huang and Duan [26] conducted characteristics comparison study of both traditional tourist information services and those incorporated in smart tourism against Chinese market. And they found that smart tourism information service has significant influence on tourist destinations, enterprises and

also tourists themselves. From the industry perspective hotels use ICT in their operation to increase productivity, reduce expenses, and improve the service quality and it brings sustainability in profit and better guest satisfaction. Abdul, Bakhtiar, Syaquif, Kamaruddin and Ahmad [27] identified hotels find ICT applications essential for effective strategy operation, accordingly the divisions for reservation, room management, accounting, and telecommunication utilize ICTs to alleviate the workload. On the contrary, other studies elucidate the perspective of customers using hotel service related applications. The customers' adoption of hotel reservation mobile apps made by hospitality corporations is examined. And the findings indicated the applications' requirements such as high information quality, good system quality, easy-of-use layout and low usage fees [25]. Gretzel, Sigala, Xiang and Koo [1] proposed three components of smart tourism: smart destination, smart experience and smart business. Smart cities (the smart destination) provide mobility, resource allocation and availability and sustainable quality of life to their residents, and further facilitate tourism with integrated smart surroundings, enhancing the experience of visitors (smart experience). Smart business refers to the complex business ecosystem of dynamically interconnected stakeholders and the exchange and co-creation of touristic resources.

Figure 2 illustrate these three components based on another three layers of data-related factors: a smart information layer that indicates data collection; a smart exchange layer that aids interconnectivity and a smart processing layer related to the analysis, visualization, integration and intelligent use of data [28].

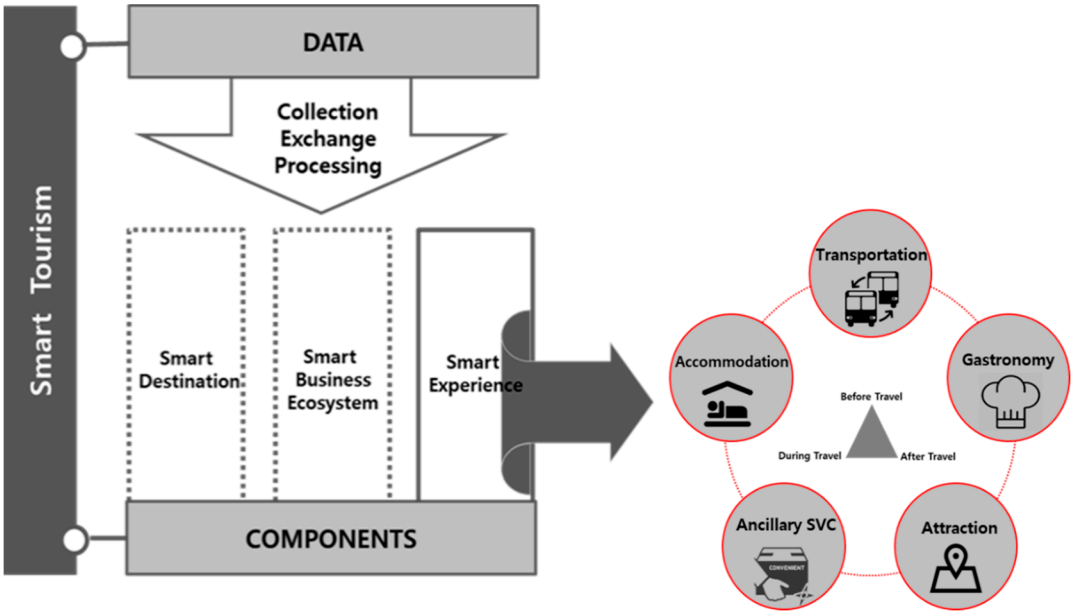

Figure 2. Components of smart tourism.

As mentioned earlier, in smart tourism, visitors not only consume data from their tourism experiences, but also enable the creation and illustration of data. Potential data for smart tourism is identified in several ways. There are six main tourist-related elements of smart cities: smart mobility, smart government, smart economy, smart people, smart living and smart environment [29]. There are also the six As of tourism-attractions, accessibility, amenities, available packages, activities, and ancillary services-which are the attributes that eventually generate profit and benefits for the destination by offering valuable experiences to tourists [29]. Figure 2 also summarizes the essential components of smart tourism: transportation, accommodation, gastronomy, attraction and ancillary service. The smart tourism experience is based on a concrete smart business ecosystem at a destination that works through data sharing among stakeholders. This refined model reflects the more nuanced and individual smart travel experience and eliminates certain potential data factors described previously, such as 'available

package,' and adds others, such as 'gastronomy.' Gastronomic tourism increasingly influences travel motivation and behavior through memorable food and drink experiences [30].

Buonincontri and Micera [31] analyzed two best smart tourism practices cities, Venice and Salzburg, and revealed that providing ICT based smart tourism services is enhancing the interaction with tourists and increasing their active participation and ultimately improving co-creation of tourism experiences. Particularly in the time of global dispersion of COVID-19 pandemic, with offline cultural activities and tourism affected by the stay-at-home quarantine order, smart tourism has its potential to rise to this challenge by creating smart tourism products exploiting AR (augmented reality) [32,33], VR (virtual reality) services [34]. There is no doubt that under social uncertainty and crisis, tourism development may be different from those noted in times of prosperity [35]. And Smart tourism approach may offer new paradigm and ecosystem to the stakeholders. Korean government has just launched new project to encourage travel startups expanding their business domain through exploiting advanced ICT benefits. The following section will explore the city offering smart tourism experiences, smart tourism city, in more detail.

2.3. Smart Tourism City

The fourth industrial revolution has bolstered development in the tourism industry, and many cities tap into their tourism competitiveness by developing a smart tourism ecosystem based on existing smart city digital technology infrastructures. These developments in tourism have worked to catalyze the idea of building smart tourism cities. If so, is it true that tourism becomes smarter when tourism meet smart city? Making a movement to a smart city, visitors are guaranteed to indulge smart tourism experiences? Examining the smart city phenomenon in the tourism context is definitely crucial, particularly regarding its influence on the travel experience and its citizens' quality life. In this context, a smart tourism city is defined as an innovative tourist destination that guarantees sustainable development that facilitates [11] and enhances visitors' interaction with experiences at the destination and eventually improves the residents' quality of life. Majority of researchers use the term 'destination' rather than 'city.' Both concepts are based on integrated ICT infrastructures, but the concept of 'smart tourism cities' focuses more on its residents, whereas smart tourism destinations more emphasize the enhancement of tourists' experiences [36].

Buhalis and Amaranggana [16] emphasized that smart tourism city is required to enhance tourism experience through more personalized products/services to meet each of visitor's unique preferences. Using of big data could be the solution for providing right services that suit users' preference at the right time. However emphatically interconnecting with stakeholders becomes also critical for understanding the unique preferences of visitors and the competitiveness of cities. Smart cities embraced the five main stakeholders in tourism: governments, tourism organizations, local residents, tourists and environments [16]. Collaboration between stakeholders and a user-friendly platform based on connected infrastructure ensures the enhancement of the quality of life for locals, enriches the experiences of tourists, boosts private businesses, and increases governments' competitiveness in terms of smart personal experiences, occupations and the highest value for the environment. Services offered by smart tourism cities have to be useful throughout the travel phase as they facilitate tourists' ability to organize schedules, peruse information about the city and check local transportation. Thus, a smart tourism city requires the physical infrastructure, technology, a resource database, and the city's basic conditions to promote tourism development [37]. Most importantly, a smart tourism city provides intelligent services to visitors in terms of transportation, gastronomy, accommodation, ancillary services and attractions throughout three phases: the pre-travel (planning) phase, the travel (onsite) phase and the post-travel phase (evaluation). All those services are realized on the basis of the main domains of the smart city infrastructure: service, land and infrastructure.

Figure 3, below, depicts the components of the smart tourism city as an interpretative framework of symbolic components, based on the literature presented in the previous sections. The proposed framework provides a clearer explanation of the origin of the smart tourism city.

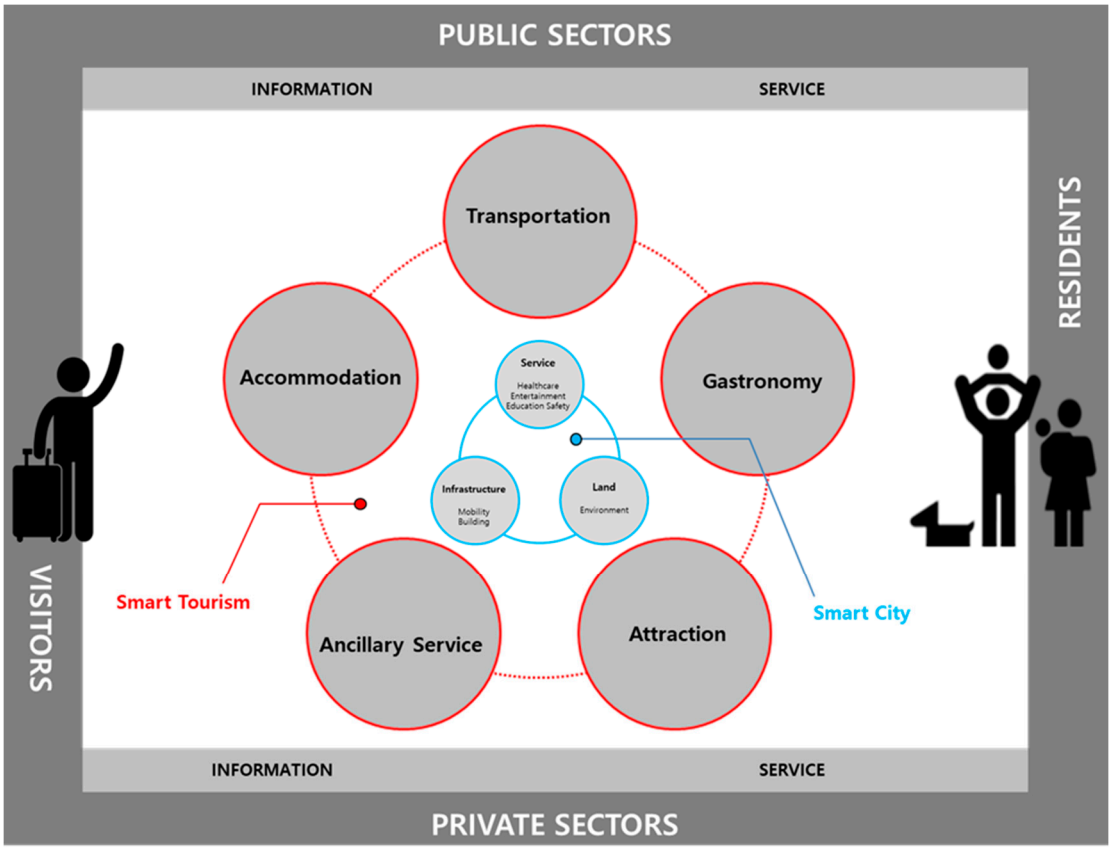

Figure 3. Components of a smart tourism city.

As shown in Figure 3, organic relationships that present information and service transactions as a result of data sharing between the public and private sectors. And visitors and residents are playing a significant role in providing and receiving that information (see outside frame). The connected circles, five smart tourism components, embrace the three components of the smart city, showing the integrated and coordinated implementation of the technological components to enhance the smart tourism experience during all three traveling phases. The active participation of both visitors and residents by sharing their on-site experiences is highly crucial during the smart experience process. In this regard, on the basis of the smart cities' dimensions (namely, smart governance, smart economy, smart environment, smart mobility, smart living and smart people), smart tourism cities are realized in accordance with the destination's components, providing AR/VR services, vehicle tracking systems, multi-lingual applications, near field communication tags and registering complaints systems, etc.

Venice, one of most popular destinations in Europe, introduced an application named "VeneziaUnica", which helps tourists experience direct interaction with the destination supply system, inducing their active participation and facilitating experience sharing. Specifically, the application enables users to directly contact service providers and their websites and share opinions and photos with other users. Salzburg, a historical, artistic and cultural destination in Austria, realized its "Master Plan 2025—Smart City Salzburg" which is related to livability, intelligent networking, sustainable mobility and open collaboration. An application, "Salzburger Mittagsplaner" was introduced to empower its users to collect information on service providers (restaurants, pubs, bistros and cafes), including menus, prices and locations, and allows them to choose seats and decide what to eat in advance. Afterward, users may share opinions and their preferences. To promote tourism in Korea, the Korea Tourism Organization (KTO) provides "VisitKorea," an application, that offers the latest travel information, categorized information (shopping, accommodation, dining and more), customized travel plans and discount coupons. Seoul, as a smart tourism city, offers a variety of smart attractions

that offer experience connectivity (see Table 1). Also, the Korean government has just launched new project to create a smart tourism city to support travel startups expanding their business domain based on ICT and provide advanced contents and infrastructures to the residents and visitors.

Table 1. Experience connectivity in smart tourism city.

Attractions	Smart Tech. Tools	Locations	Elements	Smart Experience Enhancement
BOUT: Uber Boat (Finland)	Application	On-site	Transportation	• The licensed owners, independent entrepreneurs, carrying passengers on a commercial basis. • Active participation: Improve access to islands and waterfronts in the Helsinki metropolitan area • Interaction: For-profit P2P platform for on-demand boat rides
VeneziaUnica (Italy)	Application	On-site Post-travel	Service Activity Attraction	• Active participation: Directly contact service providers and their websites • Interaction: Share opinions and photos with other users
Salzburger Mittagsplaner (Austria)	Application	Pre-travel On-site Post-travel	Service Activity Gastronomy	• Active participation: Empowering users to collect information on food and beverage service providers • Interaction: Links to providers' websites and share opinions
K-live (Korea)	Hologram	On-site	Activity Ancillary Service	• Active participation: Digital attractions such as photo box, star lounge, secret window and three-dimensional representations of K-pop stars' performances • Interaction: Directly contacts service providers and books tickets
City of Love (Korea)	Games and Application	On-site	Attraction Transportation Activity	• Active participation: 'Escape' game playing at Seoulro-7017, with mission rewards and opportunities to upload photos using a geo-reference system • Interaction: Links to nearby retail shops and tourism attractions

Although smart tourism city sheds light on destination city's competitiveness, but the journey to sustainability may be long and there would be no shortcut. The concept and paradigm of smart tourism cities should not overlook the multitude of collateral aspects such as privacy or data storage [38]. In fact, a smartphone is the pivot of all smart systems since users' data are stored mostly via smartphones and the city monitor the physical world in real time and provide intelligent services to both residents and visitors mostly via smartphones [18]. Nevertheless, collecting data from smartphones may cause the security and privacy problem for cities such as data over-collection: smartphones apps collect users' data exceeding its initial purpose [39]. Therefore, the cities are recommended to take a prudent approach in its operating smart tourism city services. For instance securing a network with a large

attack surface, properly utilizing artificial intelligence [40], identifying at stake privacy concerns associated with specific technologies, checking suitability with EU data protection regulation, and developing a specific city policy accordingly [41] are the indisputable ways of ensuring privacy. There is no doubt that tourists' experiences mediated by ICT are decisive in destination cities depending on how the city is ready with appropriate policies and actions which encourage tourists share and use smart technologies to enhance experiences [42].

3. Smart Tourism City Roles

3.1. Sustainability Problems

Tourism destination is a place where offering tourism infrastructures and package of tourism services [43] and focuses on tourism related services and infrastructures to meet visitors' expectations. Ritchie and Crouch [44] assessed tourism destination competitiveness through categorizing it into supporting factors, core resources and attractions, destination management and determinants. Since the tourism business reflects current and future economic, social and environmental impacts, addressing the needs of visitors, the industry, the environment and host communities [45]. Thus, tourism must be sustainable in environmental, economic and socio-cultural dimensions. The model of Vargas [46] is the most well-known conceptual model of destination competitiveness in tourism literature and has been the starting point for many other research studies 'sustainable' destination competitiveness. Cucculelli and Goffi [47] extends the Richie and Crouch [44] model and examined a set of sustainability indicators that factors directly referring to sustainability have a positive impact on all the competitiveness indicators on their study of "destinations of excellence" based on the model of destination competitiveness.

In terms of sustainability, cities face over-tourism and inclusive tourism issues. Tourism growth can be a potential cause of environmental damage and sociocultural problems [48]. With environmental damage and sociocultural problems caused by too many tourists, inhabitants experience routine-life-disturbance, tourists would no longer be welcome. Over-tourism occurs when too many tourists overwhelm a destination, displacing the balance from positive effects to a situation in which tourism becomes unsustainable. Originally burdened with problems in globalization, rapid urbanization, competitiveness and sustainable development, popular tourism cities are now facing tourism growth that challenges existing carrying capacity. The combination of budget flights and home-sharing sites has contributed significantly to over-tourism: Budget airlines enable more people to reach tourism destinations: home-sharing sites, Airbnb, provide accommodation in the middle of local community so that tourists can experience local life in communities.

Over-tourism manifests itself differently in each destination but is based on the common themes of alienated local residents, degraded tourist experience, overloaded infrastructure, damage to nature and threats to culture and heritage [49]. These problems manifest themselves in a variety of ways. In Barcelona, unlicensed rentals caused an incident between a landlord and his tenant for illegally listing a flat on Airbnb. Moreover, as Airbnb has become ever more commercialized, it has caused problems for the housing market and lives of local people. The demand for apartments from visitors means local people are pushed out. Therefore, locals fear being priced out of the city. The city of Lucerne is a very popular destination for Asian tourists is now facing complaints from the locals regarding traffic congestion in the town, which they allege is caused by tourist buses dropping off visitors. The problem involves overcrowding on the streets and too many people trying to gain access to key tourist spots in town and the lack of infrastructure around it. In a town with just 80,000 inhabitants, locals are starting to complain and issue warnings that the city must figure out a way to ensure sustainable tourism development. Challenges include reducing resource costs and creating market differentiation prior to developing the market further. Venice, too, has a problem with over-tourism in that the influx of over 30 million tourists a year is threatening its authentic ambience. As a solution, the Venice City government has restricted tourists to a few of the attractions and introduced a prohibition on new tourist accommodations as part of its self-preservation concerns about over-tourism. Amsterdammer

were happy on the day the city removed the iconic "I Amsterdam" letters from the Museumplein in its efforts to 'chase away' tourist after suffering from too many tourists. Bukchon Hanok Village in Seoul is one of the most popular attractions for visitors as it is a 600-year-old historic village featuring traditional Korean houses. More than 10,000 visitors visit Bukchon Hanok Village from 6 am onward every day, which causes tourism fatigue. Accordingly the Seoul government presented a guidebook on how to walk around Bukchon Hanok Village and specifically requests visitors not to make any loud noises, take pictures of residents or look into people's houses.

Practicing inclusive tourism is also an issue for cities' sustainable development. As tourism in the socio-cultural context must particularly contribute to inter-cultural understanding and tolerance, United Nations World Tourism Organization (UNWTO) [45] highlights tourism should be a driver of inclusive development. "inclusive tourism" is generally referred to as "disabled tourism' or "accessible tourism," which is about making travel easy for all people; that is, inclusive tourism involves a set of services and facilities that offer people, including the disabled, pregnant women, children in prams and seniors, accessibility that facilitates mobility, vision, hearing and the cognitive dimensions of access. Darcy and Dickson [50] asserted that accessibility in tourism is a social right that concerns all citizens. Such service includes emotional support, so that technology does not bear the entire burden, and various options are made available, which instills confidence in all people, empowering them to indulge in new experiences.

3.2. Smart Tourism City Solutions

Over-tourism may also bring with it low levels of hostility or, in some places, there may be extreme cases of violence. In this regard, UNWTO [5] has warned that people will not travel to places where they are made to feel unwelcome and that many jobs are at stake in such locations. However, bans and restrictions are not ideal solutions to over-tourism. City governments must still maximize the positive impacts of tourism because 11% of global consumption involves tourists as consumers.

With COVID-19 outbreak, the world stays home, there is no tourism. Some cities like Amsterdam still said that they want their only for Amsterdammers: only quality tourism, no more massive tourists in their city. Whereas some cites reliant on travel and tourism for survival since tourism is one of the biggest employers. Those cities face survival concerns, as one of the biggest and fastest growing sectors, tourism, has been considered as a vulnerable industry under the pandemic. How can we make tourism generate ideal benefit to all of us? No matter what is a city's approach, the impacts of tourism are diverse. Further over-tourism is generally observed in specific parts of the city at a certain time which means it would be a residents' perception regardless intensity of travel activities [51]. However, the solution for dealing with over-tourism issues has to be diverse depending on local context and has a sustainable approach in the long-term [38].

A long-term solution regarding the demands from locals and destinations for more sustainable tourism practices is to promote travel during off-peak seasons, which will help reduce the negative impacts of over-tourism. In fact, not all tourism destinations are crowded with tourists, and many cities are keen to have more tourists. And ICT could be one of solution and there is a need for an increasing use of "smart" technology to design smart tourism city to rise to this challenge [52] in spite of technological or smart solutions alone will not solve over-tourism [51]. As smart sustainability is regarded as a new perspective in the sustainable tourism debate, Perles and Ivars [53] identified the elements of smartness and sustainability which benefit from synergetic approach: monitoring systems, real-time management, public-private cooperation, and open innovation are closely related elements.

In this context, the smart tourism city, a tourism destination based on an extremely developed technological infrastructure and enable tourists to communicate and interact with their environment, offers opportunities to address these challenges with its systematic collaboration among diverse stakeholders, advanced infrastructure and user-friendly platform in a connected city. A smart tourism city would not only solve urban problems and provide citizens with a better living environment [25], but would also enable visitors to explore new destinations and indulge in local products and services

at the right time by having real time available and infrastructure to control. Thus, under the smart tourism city, governments take a more novel approach to tourism that could mitigate the negative effects using aggregated and analyzed data from each stakeholder.

Pearce [38] identified five specific themes needed for limiting over-tourism and offering sustainable quality of life for residents and unique experiences for visitors: smart preparation, smart guest, smart traveler, smart user of technology and smart immersion. "Smart traveler" and "smart technology user" are the solutions based on smart tourism city factors. First, "smart traveler" is about key phases of the tourists' mobility efforts: getting there, getting around and leaving destinations. Using data offered to tourists may help smooth the local traffic flow. Second, "smart technology user" is about the tourists' abilities to manage their time and reduce their impacts. Using online live streams of notices regarding peak visiting times at sites, mobile guides and access to services reduces frustrations for the tourists themselves and the residents. After all governments and local authorities must look for ways to control tourist numbers and it is essential to work closely between public sectors, locals and tourism companies and share gathered "data", respectively based on extremely developed technological infrastructure. The City of Barcelona, recognizing that the city was facing a severe over-tourism problem, used data aggregates based on cutting-edge technology and developed an apartment rental-detection program, a novel solution designed to fight illegal tourist apartment rentals. This user-friendly platform provides information to residents and visitors and increases the quality of life for both parties.

As a smart tourism city provides increasingly customized and enriched tourism experiences to people, such a city should concern itself with its role in inclusive sustainable tourism and transform its accessibility to include all people, irrespective of their gender, age or physical status. ICT solutions, such as beacons, which add intelligence to the identification and location of close objects, could be developed into inclusive devices in this regard. A few cities have transformed themselves into smart tourism city to contribute to inclusivity in the context of sustainable development: Vancouver, Hamburg and Copenhagen have taken initiatives and developed more accessible cities to enhance their inhabitants' quality of life as well as attract more varied visitors. Vancouver is collaborating with experts to ensure universal design and accessibility best practices in its region by 2024. The city government announced collaboration between the public and private sectors on projects such as monitoring, based on information technology of tourism experiences, to identify how universally accessible they are, which, in turn, will help private businesses and communities apply for or access funding and grants to enhance the degree of inclusivity.

In sum, cities are facing a new challenge for its sustainability and inclusiveness and technology-based social infrastructure, smart tourism city, combined with creativity and innovation is the answer for designing sustainable environment for both residents and visitors.

4. Conclusions and Implications

In the past 10 years, the ICT revolution has offered cities the opportunity to solve urbanization issues by altering living environment of citizens, industries and the governing mode of cities. This entire environmental restructuring caused by ICTs, which has offered vast amounts of data, has altered the patterns of the tourism industry as well. In addition, with tremendous impacts of tourism, cities use advanced living environment to obtain its competitiveness in tourism market. In this context, a smart tourism city, convergence of smart city and smart tourism, is an innovative tourist destination that guarantees sustainable development that facilitates [11] and enhances visitors' interaction with experiences at the destination, tourism quality over quantity, and eventually improves the residents' quality of life. The concept of the smart tourism city is based on data sharing between the public and private sectors; visitors and residents are playing a significant role in providing and receiving that information. The active participation of both visitors and residents by sharing their on-site experiences is highly crucial during the smart experience process. The components of smart city are combined with the elements of smart city (service, infrastructure, land) and smart tourism (transportation, accommodation, gastronomy, attraction and ancillary service). The integrated and coordinated

implementation of the smart city elements is to enhance the smart tourism experience during all three traveling phases (before–during–after). The development of a smart tourism city depends highly on its local context factors. In fact, a tourism city in which the tourists are of central importance also has the ultimate goal of enhancing the city's competitiveness [54]. More important, the smart tourism city's competitiveness can be increased by government leadership based on environmental quality [55], and cities must identify their strong spots that can accommodate massive numbers of visitors, and the spots they want to remain untapped.

On the other hand in terms of sustainable development, cities face over-tourism and inclusive tourism issues. Last few years, too many tourists overwhelm a destination, thereby displacing the balance from positive effects to one where tourism becomes unsustainable. Many popular destinations are suffering from over-tourism, which hinders residents' daily routine. Smart tourism city is likewise one of powerful solution to the challenges posed by sustainable development issues such as over-tourism and rapid urbanization and can serve as a dynamic means to enhance local economies via tourism. Smart tourism city with an extremely developed technological infrastructure enables tourists to communicate and interact with their environment by monitoring and controlling overflow crowd with its systematic collaboration among diverse stakeholders, advanced infrastructure and user-friendly platform in a connected city. Moreover as new technologies have contributed to making the tourism experience more accessible and rewarding for "everyone," smart tourism cities must include not only geographic fair development principles, but also social inclusiveness for the population as a whole, which is the principle that human rights must be afforded to everyone without exception. Smart tourism city development should benefit all and displace none and transform the domain beyond the traditional mindset of tourism. Of course, the ICT revolution alone is not the answer for sustainable development [46] since the concept of smart city is highly complex and interdependent [56]. Moreover, smart city framework is a much stronger focus on advanced technology than sustainability framework. However smart city encompass aspects of the sustainability challenge by developing smart solutions for sustainability and promoting citizen participation. Therefore, it is imperative to measure the impact of smart city in relation to sustainability: contribution towards environmental, economic or social sustainability [57].

The role of a smart tourism city is not limited. Particularly smart tourism city is even more focused in terms of standardization protocols for increased data sharing in the event of COVID-19 outbreak [58,59]. People are canceling their travel plans and staying at home, smart tourism city may consider creating timely customized AR/VR contents which was initially for natural preservation and enhancing tourists' experiences. Thus, smart tourism city development requires the informed participation of each stakeholder to shape the city efficiently and gain sustainable competitiveness in this dynamic tourism market [45].

This study underlines the city government's approach, which is based on the following key aspects: (1) Rational or based on prioritizing the residents' and tourists' enterprise, for which the city must develop a tourism infrastructure that offers vigorous technological connectivity among related entities; and (2) Emotional, that is, the city must involve itself in the full cycle of tourism consumption. Thus, its "every" resident will be protected from overcrowding tourist problems, and its tourists will be guaranteed personalized, inclusive-travel experiences. Furthermore, its industries will be motivated to take the initiative to share and create the information needed. Finally, we need to ask what makes a city "smart" and which smart tourism cities do we design for the sustainable development. To answer this question, the ideal approach is to shift the focus from technologies to the people.

This study provides an overview of the smart tourism city and helps academia and industry practitioners identify the main components of smart tourism city and its contexts. While in recent years obvious progress has been made in smart tourism destination research, but there is research gap in smart tourism "city" which focuses more on its residents. Further by identifying of smart tourism city roles, this study provides long term solution to design sustainable city where embracing residents' and tourists' quality of life and experience. While this study contributed to a better understanding of

anatomy of smart tourism city, limitations remain. First, the components of smart tourism city model were designed focusing on limited factors in the previous studies. Second, it has lack of theoretical findings, but it sought to emphasize the current issues in tourism, sustainability and proposed smart tourism city as one of powerful solution. However further research is needed to strengthen the empirical and theoretical contributions.

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