Reinventing tourism cities: Examining technologies, applications and city branding in leading smart cities

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Abstract

Cities have become the engines of economic development more than ever before. Nowadays, numerous cities have been using technological and innovative service delivery tools called "smart city technologies and applications" to affect living conditions of their residents and visitors positively. These technologies and applications can be seen at government and private buildings, city facilities and management, informational and communicational technology infrastructure and personal services. They have a net-positive impact on the environment and natural resources by reducing harmful emissions, excessive and unnecessary use of energy, water, gas, public and private transport vehicles etc. On the city branding side, efficient, sustainable and powerful city economy, security, tidiness, regularity in urban facilities, enhanced civic imagery and a decent quality of life have made a city attractive to its target audiences. In this paper, smart city technologies and applications in the world's leading smart cities were examined. Thereafter, common and/or city-specific applications were listed. Finally, in the light of these findings, some suggestions were put forward for tourism cities which aim to realize sustainable economic development by means of tourism and be an attractive city/destination for their existing and prospective visitors.

Keywords: tourism city, destination city, city branding, smart city, smart city application, smart destination

Introduction

The question of "What will be the source of the urban growth and sustainable urban development?" has received continuous attention from researchers and policymakers for many decades (Caragliu, Del Bo & Nijkamp, 2014, p. 173). One of the most reasonable answers to the question can be the

attractivity of a city which makes people happy. At this point, new technologies and tools have become a current issue for cities in producing a variety of effective ideas for improving quality of life in production, consumption, security, information, logistics, etc.

This study aims to contribute to development of tourism cities through smart city technologies and applications that make them livable, secure, healthy, more experience-oriented, workable, and preferable for both visitors and residents. This study, thus, is related to the current smart city technologies and applications and itemizing them with the aim of developing efficient, manageable, sustainable, attractive, unique, and competitive tourism city/destination city brands.

After cities have turned to be the engines of economic growth by industrial revolution, complex, dynamic and intense economic activities have made living conditions in cities worse for residents. From that point of view, achieveing socio-economically sustainable prosperity without negatively affecting the quality of life has been expected of residents of the cities. This is also important for developing city economy by the mean of tourism nowadays. From this point of view, using technological and innovative service delivery tools and efforts like sensors, big data, Internet of Things (IoT), artificial intelligence (AI), GPS tracking, Augmented Reality (AR), Virtual Reality (VR), mobile applications, etc. can be seen as a reasonable way in developing city economy by tourism. These tools and efforts can be shortly termed as "smart city technologies and applications" (Lehr, 2018).

With the greater use of smart city technologies and applications, new advantages and opportunities can be utilized by residents which are the microeconomic actors of city economics. Smart city technologies and applications have contributed to the economic development of the city by efficient usage and allocation of limited resources for production: labor, capital, natural resources, and entrepreneurship; and increasing quality of life for residents, visitors, and other inhabitants. These technologies and applications have a net-positive impact on the environment by saving energy, water, gas etc.; and reducing harmful emissions by encouraging use of environmental-friendly transportation methods and vehicles like cycling, hybrid or electric vehicles. On the city branding side, an efficient, productive, sustainable and powerful city economy, security, tidiness, and regularity in urban facilities, enhanced civic imagery have made a city attractive to its target audience (e.g. tourists, visitors, skilled people, new investors, and new university students).

Literature Review

Smart City Concept

The 'smart city' concept has emerged as a strategic issue for the past two decades. The construct emphasizes the increasing importance of information and communication technologies (ICTs) for encompassing modern urban development factors in a common framework and for profiling cities' competitiveness based on their social and environmental capital (Caragliu et al., 2014) addressing "quality of life". The "smart cities" agenda has gained world wide attention.

According to UK (Basingstoke) based market research firm Juniper Research ranking, "*World's 5 Smartest Cities*" can be listed as (Buntz, 2016):

- Singapore

- Barcelona
- London
- San Francisco
- Oslo.

Arriving that conclusion, researchers at Juniper ranked cities by an array of factors including their adoption of smart grid technologies, intelligent lighting, the app landscape, and the use of information technology to improve traffic, Wi-Fi access points, smartphone penetration. In terms of software applications, analysts of Juniper looked at traffic apps and city information apps that leverage open data sources. They applied different weightings to transport and energy, as they believe these are the most important elements in smart cities. In evaluating transportation, Juniper analysts considered public transportation options, subtracting points for cities with high levels of private vehicle ownership. When evaluating cities' efforts to improve traffic, they assessed city planners' efforts to implement congestion charges, dynamic traffic lights, the use of road sensors, and smart parking. Regarding energy consumption, analysts looked at the kinds of policies cities are taking. They looked in particular at things like the smart grid, their smart meter rollout, and what kind of policies the local government has made for sourcing sustainable energy (Buntz, 2016).

Table 1. The Top 15 Smartest Cities in the World for 2017

1. Vienne (Austria)	6. New York (USA)	11. Hong Kong (China)
2. Chicago (USA)	7. Paramatta (Australia)	12. Tokyo (Japan)
3. **Singapore**	8. Seoul (South Korea)	13. Bristol (UK)
4. **London** (UK)	9. **Barcelona** (Spain)	14. Rio de Janeiro (Brazil)
5. Santander (Spain)	10. Denver (USA)	15. Seattle (UK)

Source: Roland Berger. (2017). Think Act: Smart city, smart strategy.
Note: Cities coinciding with Buntz (2016) in Table 1 are marked in bold.

In another research by Roland Berger (2017), 87 cities around the globe were examined by their smart strategies. In the research process, they took a close look at cities from Europe to Africa, from regional centers of less than half a million to megacities of more than 20 million. They examined cities' official "smart city strategies" and other strategic policies to discover what these cities were up to. Research reveals that most smart city strategies still have room for improvement; more and more cities are taking a strategic approach to becoming smart. But often they lack connected, end-to-end thinking. According to research, an ideal smart city strategy covers six interrelated action fields, comprising a host of subcategories and solutions: 1-Government, 2-Buildings, 3-Health, 4-Mobility, 5-Education, and 6-Energy and Environment. The Smart City Strategy Index developed by Roland Berger (2017) is based on three dimensions: action fields, strategic planning, and IT infrastructure. In conclusion, world's smartest cities listed by the research can be seen in Table 1.

Table 2. The Top 20 Smartest Cities around the World 2017

1. New York City (USA)	6. Washington D.C. (USA)	11. Toronto (Canada)	16. Sydney (Australia)
2. London (UK)	**7. Seoul (South Korea)**	**12. Chicago (USA)**	17. Geneva(Switzerland)
3. Paris (France)	8. Tokyo (Japan)	13. Zurich (Switzerland)	18. Los Angeles (USA)
4. Boston (USA)	9. Berlin (Germany)	14. Melbourne (Australia)	19. Munich (Germany)
5. San Francisco (USA	**10. Amsterdam (Netherlands)**	**15. Vienna (Austria)**	20. Baltimore (USA)

Source: Berrone & Ricart (2017). IESE cities in motion index 2017.
Note: Cities coinciding with Table 5 are marked in bold.

One another research is the fourth edition of the Cities in Motion Index-*IESE Cities in Motion Index 2017*. It was prepared by the IESE Center for Globalization and Strategy, under the direction of professors Pascual Berrone and Joan Enric Ricart. To compile the index, the authors analyze 79 indicators across 10 different dimensions of urban life: the economy, technology, human capital, social cohesion, international outreach, the environment, mobility and transportation, urban planning, public administration, and governance. The results show that almost the entire dimension measured in the ranking is led by European and North American cities. The exception is technology, where Taipei reigns (IESE Business School, 2017). According to the report, top 20 smartest cities around the world are listed as shown in Table 2.

Although there are significant structural coincidences in cities (e.g. Singapore, London, Barcelona, New York, London, Paris, Seoul, Tokyo, Amsterdam, Chicago, and Vienna) at above both types of studies, there is some confusion about what is understood by the "smart city" concept.

Accordingly, "smart city" can be defined as city where innovation in technology, telecommunication, networking, computation, sustainability and ecological design come together and create a responsible, intuitive, social, high quality, clean and advanced experience for its citizens and visitors while establishing a wise management of natural resources (Abdoullaev, 2011; Colldahl, Sonya, & Kelemen, 2013; Couzineau-Zegwaard, Barabel, & Meier, 2013; Merli & Bonollo, 2014; Nijman, 2011; Vaquero & Saiz-Alvarez, 2016). The concept of a smart city often highlights the advantages of generating greater economic, energy, governance and mobility efficiency. However, 'knowledge cities' build on this concept by putting human beings explicitly at their center, and focus on greater inclusion, pluralism, participation, education, diversity, creativity and human well-being (Broadband Commission for Sustainable Development, 2016, p. 65).

In this respect, a smart city is simply not a 'wired city' (Paskaleva, 2011, p. 154) or a technologically well-appointed "geek". First and foremost, progressive smart cities must seriously start with people and the human capital side of the equation, rather than blindly believing that IT itself can automatically transform and improve cities (Hollands, 2008, p. 315). Paquet (2001, p. 29) and Hollands (2008, p. 315) agreed in the creation of smart communities, "the critical factor in any successful community (e.g. venture, enterprise, and city) has to be its people and how they interact". From this point of view, smart cities can be progressive because they use digital technologies not to hardwire themselves but to be socially-inclusive, foster good governance and create better services which improve the quality of life for its citizens, with an outlook on long-term sustainability and competitiveness (Paskaleva, 2011, p. 154). Needless to say that improving the quality of life serves visitors and tourists as well.

A smart city is a city that learned to integrate IoT, AI, machine learning, information and ICTs and engineering technologies to make the life of its citizens more practical, manageable, easier, well, and smarter. It's basically a city with a network of interconnected sensors that collect data and use the results for the benefit of its residents. This includes automating municipal processes and services, automating entire infrastructures (transportation, parking, street lighting, water, energy and waste management, etc.) and solving, controlling and even preventing issues based on the data collected. The "smartness" of the city depends on smart city technologies such as the quantity and quality of sensors and the analysts and the other technologies that process the massive volumes of

live data provided by the sensors (Skelia, 2017). These criteria are also needed to take into consideration in developing smart tourism city/destination.

Smart City Technologies

As part of their task, smart city applications interact with various (technological) networks and devices. A smart city application may send data over public networks such as the Internet, cellular networks, networks that belong to different providers, or self-organized wireless sensor networks. The devices used in these networks vary from a large cloud and network servers, through customer equipment, down to small sensor nodes (Krimmling & Peter, 2014). These technologies have continuously developed with a multitude of next-generation wireless technologies such as Li-Fi, 5G, LoRa and Network Slicing (Carritech Telecommunications, 2017). In conformity with the above explanations, some smart city technologies are compiled and sorted in Table 3.

Table 3. Smart City Technologies

1. Internet (High speed, broadband)	18. Advanced analytics	35. Smart card
2. ICTs	19. Business Intelligence	36. Artificial Intelligence (AI)
3. Sensors and connectivity	20. Digital modeling	37. Augmented Reality (AR)
4. Cameras	21. Drones	38. Virtual Reality (VR)
5. Information technology	22. Hardware development	39. Smartphone penetration
6. Infrastructure development	23. Robotics	40. Wi-Fi Access points
7. Open data access	24. Service integration	41. Dashboards
8. Big Data	25. Software development	42. Data visualisation
9. Interoperability	26. Telecommunications	43. City platform
10. Distributed architectures	27. Geoinformation	44. Network Slicing
11. Blockchain data bases	28. Global Positioning Data (GPS) Tracking	45. Li-Fi (LED)
12. Network infrastructure	29. 3D Geo-locating	46. LoRa (IoT Network Platform)
13. Data centers	30. IoT (Internet of Things)	47. 3G
14. Data management systems	31. IoS (Internet of Services)	48. 4G
15. Disruptive technologies	32. IoP (Internet of People)	49. 5G
16. Cloud (city platform)	33. Crowdsourcing technologies	50. Digital fabrication
17. Computer networking	34. Collaboration technologies (NGOs, Municipalities, Universities, Developer, Citizens…)	

Smart City Applications and Action Areas

A smart city is expected to perform smart applications and solutions (Benli & Gezer, 2016; Kinnear, 2016; Lewis, 2016; Roland Berger, 2017; Skelia, 2017; SmartAppCity, 2017; Smart City Expo, 2017). Smart city applications are commonly mentioned by some topics/characteristics/areas/action fields/key dimensions in related resources. Topics/characteristics/areas/action fields/key dimensions in above resources related to smart city applications can be seen at Table 4 relatively.

Table 4. Action Areas for Smart City Applications

Giffinger et al. (2007) 6 Characteristics	Berrone & Ricart (2017) 10 Key Dimensions	Roland Berger (2017) 6 Action Fields	Smart City Expo World Congress 2017 8 Topics
1-Economy (Competitiveness)	1-Human Capital	1-Government	1-Governance
2-People (Social and Human Capital)	2-Social Cohesion	2-Buildings	2-Mobility
3-Governance (Participation)	3-Economy	3-Health	3-Safe Cities
4-Mobility (Transport and ICT)	4-Public Management	4-Mobility	4-Economy
5-Environment (Natural Resources)	5-Governance	5-Education	5-Sustainability
6-Living (Quality of Life)	6-Environment	6-Energy and Environment	6-Circular Economy
	7-Mobility and Transportation		7-Society
	8-Urban Planning		8-Data&Technology
	9-International Outreach		
	10-Technology		

Smart City and Tourism: Smart Tourism City, Destination City or Smart Destination

As people are always in a rush as a result of economical, functional or quality of life reasons, being a smart city can be seen as an inevitable situation. In the same way, a city needs to be smarter after increasing its population by tourism movements as well. Smart city applications have positively affected tourist services, safety and security, tourist mobility, quality of life, touristic shopping, facilitating access to miscellaneous daily necessities. In line with this thinking, special precautions need to be taken, particularly in the currently most visited cities. It is very crucial to be able to manage predictable or unpredictable situations (e.g. natural hazards, terror, accidents, and a traffic jam) and avoid them.

Table 5. Global Top 20 Destination Cities by International Overnight Visitors-2016

Destination City (Overnight Visitors)	Destination City (Overnight Visitors)	Destination City (Overnight Visitors)	Destination City (Overnight Visitors)
1. Bangkok (21.47 mn)	6. Singapore (12.11 mn)	11. Hong Kong (8.37 mn)	16. Rome (7.12 mn)
2. London (19.88 mn)	7. Kuala Lumpur (12.02 mn)	12. Barcelona (8.20 mn)	17. Osaka (7.02 mn)
3. Paris (18.03 mn)	8. Istanbul (11.95 mn)	13. Amsterdam (8.00 mn)	18. Vienna (6.69 mn)
4. Dubai (15.27 mn)	9. Tokyo (11.70 mn)	14. Milan (7.65 mn)	19. Shanghai (6.12 mn)
5. New York (12.75 mn)	10. Seoul (10.20 mn)	15. Taipei (7.35 mn)	20. Prague (5.81 mn)

Source: Hedrick-Wong & Choong (2016). Global destination cities index by Mastercard.

Cities that intend to maintain economic development through tourism have benefited from planning and managing the city on this basis. At this point, practices that applied by world's cities which have both smart and touristic qualities can be useful. Such kind of cities are determined by the coinciding list of most visited and lists of smartest cities in the world. For former list "Mastercard's Destination Cities Index Report-2016" which was prepared by Yuwa Hedrick-Wong and Desmond Choong has seen practical. In this report, world most visited cities are nominated as shown in Table 5 as "Global Top 20 Destination Cities by International Overnight Visitors-2016".

Methodology

Sample

A practical/pragmatical method is adopted in determining which smart city applications should be used in leading tourism cities. In line with this thinking, "Destination Cities Index by Mastercard Report-2016" which was prepared by Yuwa Hedrick-Wong and Desmond Choong is based. To determine leading smart tourism cities among world's most visited cities; Global Destination Cities Index by Mastercard research report was utilized. According to Global Destination Cities Index by Mastercard research report, top 20 most visited world cities were listed. Then these cities were compared with various lists for "world's top smart cities" such as Roland Berger's (2017) "Smart City, Smart Strategy" report; UK based market research firm Juniper Research's "World's 5 Smartest Cities" list shared by Buntz (2016); and "IESE Cities in Motion Index 2017" report prepared by Pascual Berrone and Joan Enric Ricart from IESE Business School.

Table 6. Overlapping Cities in Smartness, Visitor Number and City Branding

Destination City (Overnight Visitors)	Destination City (Smartness)	Destination City (Best City Brands)
1. Bangkok (21.47 mn)	**1. Vienne (Austria)**	**1. London**
2. London (**19.88 mn**)	2. Chicago (USA)	**2. Singapore**
3. Paris (18.03 mn)	**3. Singapore**	**3. New York**
4. Dubai (15.27 mn)	**4. London (UK)**	**4. Paris**
5. New York (**12.75 mn**)	5. Santander (Spain)	5. Sidney
6. Singapore (12.11 mn)	**6. New York (USA)**	**6. Amsterdam**
7. Kuala Lumpur (12.02 mn)	7. Paramatta (Australia)	7. Los Angeles
8. Istanbul (11.95 mn)	**8. Seoul (South Korea)**	**8. Tokyo**
9. Tokyo (11.70 mn)	**9. Barcelona** (Spain)	9. San Francisco
10. Seoul (**10.20 mn**)	10. Denver (USA)	10.Toronto
11. Hong Kong (**8.37 mn**)	**11. Hong Kong (China)**	11.Melbourne
12. Barcelona (8.20 mn)	**12. Tokyo (Japan)**	12. Madrid
13. Amsterdam (8.00 mn)	13. Bristol (UK)	13. Berlin
14. Milan (7.65 mn)	14. Rio de Janeiro (Brazil)	14. San Diego
15. Taipei (7.35 mn)	15. Seattle (UK)	15. Moscow
16. Rome (7.12 mn)	**16. Paris (France)**	16. Munich
17. Osaka (7.02 mn)	**17. Amsterdam (Netherlands)**	**17. Vienne**
18. Vienna (**6.69 mn**)		**32. Barcelona**
19. Shanghai (6.12 mn)		**34. Hong Kong**
20. Prague (5.81 mn)		**42. Seoul**

Note: "mn" = million.

After comparing top 20 most visited cities (See Table 5) by Mastercard's Global Destination Cities Index Report with top 20 smartest cities by UK based market research firm Juniper Research's "World's 5 Smartest Cities"; Rolnd Berger's (2017) "Smart City, Smart Strategy Report" and "IESE Cities in Motion Index 2017" lists, It has been found that 10 cities coincided as "*most visited smart cities*" (See Table 6). After all, the sample consists of names written in bold in Table 6: 1-London, 2-Paris, 3-New York, 4-Singapore, 5-Tokyo, 6-Seoul, 7-Hong Kong, 8-Barcelona, 9-Amsterdam ve 10-Vienna. Ranking of these cities in the 2017 World's Best City Brands list by the Resonance Consultancy (2017) can be seen in the third column of Table 6. Considering Table 6, it can be seen that smartness, increase in attracting tourist, and brand ranking for a city are connected.

Data Collection

Data needed for the study was retrieved by analyzing secondary data sources. Smart city applications used in the sample cities were listed. In data collection phase, qualitative research methods were used. Datawas collected by using content analysis. Research question was employed to derive data systematically from related materials. Tables have been used to specify contents in clusters.

Data Source

Materials like journal articles, websites, books and secondary statistics about sample cities (London, Paris, New York, Singapore, Tokyo, Seoul, Hong Kong, Barcelona, Amsterdam and Vienna) were used as data source for this research.

Empirical Model

This is an exploratory study. In the study, "scanning model" with the qualitative analysis is the preferred tool. With qualitative analysis, contents related to "smart city applications" were retrieved from the materials. After that, "tourism-related practices" and "city branding related practices" were analyzed. The below research question was utilized to retrieve needed data systematically:

- Which smart city applications are utilized in the city destination spesific to tourism and city branding?

Findings

In this section, world's leading smart cities listed in "Data Source" section have been examined from the "smart city applications" aspects. Common and/or city-specific applications were listed. This section also contains discussions about the use of smart city applications for tourism and city branding aspects.

After studying "Smart City Applications and Action Areas" in relation to tourism and city branding, 5 action areas can be characterized. These characterized action areas can be listed as:

- Governance,
- Mobility,
- Quality of Public Sphere,
- Sustainable Environment and Resources and
- Developing Entrepreneurship and International Economy.

Tourists and visitors travel to a destination city for leisure, business or vacation purposes. When they visit a destination city, they experience at least security and safety, dining, shopping, lodging, a transport service or public transportation. Moreover, when people are traveling they expect their experiences to be both flowless and tailormade. So, cities that apply technology to simplify services and connect people with their passion points can become true destination cities and realize the benefits of increased visitors and greater income (Menendez, 2017). In this context, smart

applications facilitate and enable delivering the tourism services (e.g. security and safety, dining, shopping, lodging, public transportation).

Table 7. Action Areas for Smart Tourism Cities

Governance	Political strategies & perspectives, destination management, building awareness, education-lifelong learning, participation in decision-making, public and social services, city promotion, e-government, transparency, effectiveness, quality and sound guidance of state intervention, city-to-city cooperation, public-public cooperation, cooperation platforms, open data, open innovation, service integration, tax policy, new management and organization models.
Mobility	Local accessibility, (Inter-)national accessibility, availability of ICT-infrastructure, sustainable, innovative and safe transport systems, facilitating movement through cities and access to public services, road and route infrastructure, the vehicle fleet, public transportation, metro, cycling, air transportation, externalities both need to commute and because of the need for an outlet for production, intelligent traffic management systems, smart services for public transport, smart urban logistics, electric vehicle, freight, logistics optimization, integration platforms, mobility as a service, non-motorized mobility, parking, pedestrian strategy, policy framework, real-time data, shared transportation, transport hubs, transportation networks, connected & self-driving vehicle, intelligent transport systems, multimodal transport system, walkable sustainable urban mobility.
Quality of Public Sphere	Individual safety and security, residents support, diversity, women rights, care for elderly people, immigrants, peace, social cohesion, health and hygiene, accommodation quality, cultural facilities, sub-structure, super-structure, city cosmetics, natural hazards management plans, emergency action plans, cybersecurity, disaster recovery, touristic attractivity.
Sustainable Environment and Resources	Attractivity of natural conditions, environment, water, air pollution, environmental protection, sustainable resource management, recycling, smart grid, smart lighting, water and waste management, green building, smart building, housing, alternative energy production, zero waste.
Developing Entrepreneurship and International Economy	Innovative spirit, entrepreneurship, economic image & trademarks, productivity, flexibility of labour market, international embeddedness, ability to transform, promoting economic development of a territory, local economic development plans, transition plans, cluster generation, innovation, new business model, cooperation model, financing, investing, public procurement, user value, public value, shared value, sharing economy, social economy, startup, public-private-people partnership, securing a privileged place in the world, maintaining global impact involves improving the city brand, international recognition through strategic tourism plans, attracting of foreign investment, representation abroad, building and putting forward the differences.

"City branding" can simply be defined as the use of marketing communications tool and, when applied, it serves to enhance the quality of life to give the city uniqueness in the sight of residents, tourists, travelers, and businesses. By utilising city branding practices when applied, a city enhances the quality of life and spreads information about its unique values, motto, theme, plot, feeling tone, mission, current culture, vision, and any of its other tangible and intangible qualities to its target audiences by collaborating with its stakeholders. Branding itself helps a destination city to compete in the global tourism market in attracting the people who want to live, visit and work there. In this context, smart applications to facilitate or enable delivering the city branding functions (e.g. enhancing the quality of life and spreading information about its unique values, motto, plot, mission, current culture, vision and its other qualities) are useful.

Smart city applications used in sample smart tourism cities are listed as below. Listed smart city applications are marked as (T) if it is related to "tourism"; are marked as (B) if it is related to "city branding", and are marked as (T&B) if it is related to both "tourism" and "city branding":

Governance

- (B) Digital public administration (Monitoring stream of data about city) (Amsterdam, Vienne)
- (B) Real-time decision-making systems (Barcelona, Vienne)
- (B) Participatory governance/Citizen Participation (Vienne)
- (T&B) E-services (Vienne)
- (B) Urban education platforms
- (B) Digital learning formats (Vienne)
- (B) Developing Digital skills to eliminate young unemployment (e.g. Tech City Stars-London, Vienne)

Mobility

- (T&B) Smart traffic (congestion) monitoring systems (Amsterdam)
- (T&B) Real-time traffic and route management by means of social media (e.g. London, Amsterdam)
- (T&B) Smart traffic lights (optimized green light usage-Barcelona, Amsterdam)
- (T&B) Smart/Mobile/Contactless payment systems (e.g. Oystercard-London, Barcelona, Vienne)
- (T&B) Smart Bus stop
- (B) Smart EV Charging Station for Car (Amsterdam, Barcelona)
- (T) Transport Info/Journey Planning (Amsterdam)
- (T&B) Smart and efficient services for public transport (BusGuru-London, Barcelona, Vienne)
- (T&B) Transport/Ride/City Bike-sharing programs (Bike Like a Local-Amsterdam, Vienne)
- (T&B) Smart parking (e.g. Streetline, ParkMe-Amsterdam)
- (T) City Street Guide

Quality of Public Sphere

- (B) Integrated health information systems (Vienne)
- (T&B) Ambient assisted living (Vienne)
- (B) Broadband for all citizens
- (T&B) Real-time information, news (Amsterdam, Vienne)
- (T) Reservation and e-Administration
- (T&B) Dynamic Kiosks (e.g. UrbanFlow-Helsinki, Vienne)
- (T&B) Touchscreens
- (T&B) Wi-Fi spot on bus stop (Amsterdam, New York)
- (T&B) Aging infrastructure (Vienne)

- (T&B) Improving the urban experience for local residents and travelers (Appening-Amsterdam, Vienne)
- (T&B) Smart water dispenser (for people, dogs, cats, birds)
- (T) Online Tourist Info
- (T) Smart Museums and Parks (e.g. SF Rec and Park, Amsterdam)
- (B) Shared Decision-Making-Collaboration (e.g. Civocracy-Amsterdam)
- (T&B) Crisis response system (e.g. crime, storm, terrorist attack etc.)
- (T&B) Speed-sensitive Smart road blocker (for terrorist attacks)
- (B) Lisence plate recognition systems (determining stolen cars and garage entrance as well)
- (T) Security for people (e.g. Powow, Drive Carefully-Amsterdam, Vienne)
- (T) Security for Things (FindMyBicycle-Amsterdam)
- (T) Smart Neighbourhood Safety (Buur-Amsterdam, Vienne)
- (T) Real-time Suggestions (Amsterdam)

Sustainable Environment and Resources

- (B) Solar and wind energy production and sharing (Vienne)
- (B) Stand-by Energy Saving (Crownstone-Amsterdam, Vienne)
- (B) Smart distribution grids (Amsterdam, Vienne)
- (T) Smart street lighting (Barcelona, Amsterdam, Vienne)
- (T) Highlighting Sites (Vienne, New York)
- (B) Smart electric metering (Amsterdam, Vienne)
- (T) Charging Bench/station (e.g. solar-powered Strawberry Tree-Serbia; SolaRoad, Steroa-Amsterdam, Vienne)
- (B) Smart water demand management (Amsterdam, Newyork, Vienne)
- (B) Smart water metering (Amsterdam, Vienne)
- (B) Electronic water payment systems (Amsterdam)
- (B) Water recycling system (Vienne)
- (B) Smart bin/rubbish Collection (e.g. Enevo, ECUBELabs, Barcelona, Vienne)
- (B) Smart waste management (Amsterdam, Vienne)
- (B) Smart sewage management (New York, Vienne)
- (B) Solid waste decomposition and recycling (e.g. London, Amsterdam, Vienne)
- (B) Smart irrigation for city landscaping (Amsterdam, Vienne)
- (T&B) Earthquake warning system
- (T&B) Noise monitoring (e.g. VisorAcustic)
- (B) Pollution measuring (e.g. TZOA, Amsterdam, Vienne)
- (T&B) Climate monitoring (e.g. Everimpact for greenhouse emission, Amsterdam, Vienne)
- (B) Connected facility management (Amsterdam, Vienne)
- (T) Smart home (Amsterdam)
- (T&B) Smart and green construction (Amsterdam, Vienne)
- (B) Gallery for city infrastructure services (Barcelona, Vienne)
- (T&B) Street cooling with big pipes (Masdar)

Developing Entrepreneurship and International Economy

- (B) Geoposition and publishing usage for trade
- (B) Business Intelligence (Monitor, analyze and interpret users' behaviors)
- (T&B) Shopping/Dailly Deals
- (T&B) Events
- (B) Effective usage of city production resources (Vienne)
- (B) Encouraging Innovations (Vienne)

Conclusions

This section summarizes the outcome of the research in conformity with its aim and identifies strategic tools and efforts in developing smart tourism/destination cities that are sustainable, manageable, more tourist and visitor experience oriented, privileged, competitive and socially-inclusive.

In summary, a destination city needs to offer security and safety, dining, shopping, lodging, and public transportation services in a seamless manner from the standpoint of "tourism". Particularly security and safety issues are getting much more essential. Because of the recent terrorist attacks taking place recently in major destination cities, new smart city applications should be developed and applied.

In addition to this, from the standpoint of "city branding", a destination city that intends to be different from its rivals must be able to enhance the quality of life and to spread information about its unique values, motto, theme, plot, feeling tone, mission, current culture, vision, and any of its other tangible and intangible qualities to its target audiences by collaborating with its stakeholders. City branding is a multifaceted job and looking at the Table 6, it can be seen how smartness level is related to tourist numbers attracted, and brand ranking for a city. In accomplishing these goals, a city can considerably benefit from smart city applications. It is necessary to consider some issues to effectively benefit from smart city applications in tourism and city branding.

Principally, smartness of the city relies primarily on the collaboration of the city's residents, authorities and infrastructure management (Skelia, 2017). Awareness, education and long-term oriented thinking have a crucial role in implementing smart city technologies and applications in collaboration with the city stakeholders.

Smart city applications based on "disruptive" technologies which are evolving very fast. These technologies can change the practices for destination cities, producing entirely new products and services.

The mayors or the officials of the destination cities should keep their organizational strategies updated in the face of continually evolving technologies, ensure that their organizations continue to look ahead, and use technologies to improve internal performance. In this regard, they are advised to employ a Chief Digital Officer (CDO) as Roland Berger (2017) proposed who implements-directs- operates not only IT issues but also smart city applications.

In choosing and using smart city technologies and applications, those persons in charge or mayors need to plan for immensely complicated situations against competition and risks. Cities also need to keep their stakeholders' abilities up-to-date, and keep stakeholders informed of current benefits of technologies.

Advanced technologies like the IoT can be used to improve infrastructure management. Visitors and tourists will benefit from improved infrastructure. Functional, aesthetic and promoted city components help to build powerful, attractive and bright city brands for people who want to live, visit and work in the destination city.

Because of time constraints, this research is based on secondary data resources and the 10 most visited cities. Some practical smart city applications are listed in the "Findings" section clustered in action areas in relation to tourism and city branding. By using primary data resources and enlarging the sample size, it is possible to obtain more prosperous current and potential practices and ideas for smart city applications forging the way of reinventing tourism/destination cities.

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