Smart Tourism Destinations

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Abstract The rapid development of technologies introduces smartness to all organisations and communities. The Smart Tourism Destinations (STD) concept emerges from the development of Smart Cities. With technology being embedded on all organisations and entities, destinations will exploit synergies between ubiquitous sensing technology and their social components to support the enrichment of tourist experiences. By applying smartness concept to address travellers' needs before, during and after their trip, destinations could increase their competitiveness level. This paper aims to take advantage from the development of Smart Cities by conceptualising framework for Smart Tourism Destinations through exploring tourism applications in destination and addressing both opportunities and challenges it possessed.

Keywords Smart tourism destinations · Internet of things · Smart city · Travel and tourism · Technology

1 Introduction

The rapid increase of urban population worldwide has triggered intricate challenges for cities around the world. City infrastructures are facing a massive pressure due to the fact that more than half of the world's population lives in the cities (Falconer and Mitchell 2012). As cities become increasingly competitive and complex, Information and Communications Technology (ICT) will coordinate all activities and services, leading to connected, better informed and engaged citizens.

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ICT make cities more accessible and enjoyable for both residents and visitors through interactive service interconnecting all local organisations to provide real-time services and use data centrally for better coordination.

The concept of Smart City represents an environment where technology is embedded within the city. This technology will synergise with city's social components in order to improve citizens quality of life while also improve city services efficiency, such as optimising the use of energy and better traffic monitoring (Vicini et al. 2012). Indeed, ICT supports cities in addressing their societal challenges. The development of Smart City also facilitates seamless access to value-added services both for its citizens and tourists as city visitors, such as access to real-time information on public transportation network. Further, Smart City has enable interconnectivity among city stakeholder through Internet of Things which allows cities to dynamically engage with their stakeholder (Vicini et al. 2012).

The new era of ICT has also opened a wealth of new tools for the tourism industry. Nowadays, tourism destinations face a set of new challenges arising from changes in both consumers and the environment as influenced by the emerging technologies. In order to deal with these challenges, first destinations have to recognise the kind of changes that occurred then proactively respond (Soteriades et al. 2007). From a tourism perspective, ICT could contributes in terms of generating value-added experiences for tourists, while also improving efficiency and supporting process automation for the related organisations (Werthner 2003 as cited in Gretzel 2011). Thus, the development of Smart City could also encourage the formation of Smart Tourism Destinations. With technology being embedded within the destinations environment, it can enrich tourist experiences and enhance destinations competitiveness.

While a majority of discussion present ideal images of Smart City, only few researchers have tackled Smart Tourism Destinations. This paper seeks to fill the research gap by identifying opportunities and challenges as well as conceptualising a framework for Smart Tourism Destinations towards enhancing destinations competitiveness.

2 Theoretical Background

2.1 Internet of Things

The Internet of Things (IoT) is rapidly gaining ground in the emerging world of ICT (Atzori et al. 2010). The term IoT was firstly coined by Kevin Ashton (MIT) in 1999. He defined IoT as a network that connect anything in anytime and anyplace in order to identify, locate, manage and monitor smart objects (Mingjun et al. 2012). The idea behind the IoT is to generate automatic real-time interactions among real world object that connect to the Internet which consequently also

reduce the gap between real world and digital realm (Erb 2011). Further, the development of mobile computing has also supported a plethora of applications namely combination between visual tagging of physical objects and Near Field Communication (NFC) devices that contributed to the development of the IoT (Borrego-Jaraba et al. 2011). Hence, IoT creates platforms that are able to transmit range types of data using a participatory sensing system (Gutiérrez et al. 2013). In a tourism context, tourists could simply use their mobile phones to explore the destination and events of interest using in-situ data collection and reporting. These activities leave massive size of digital traces resulting in multidimensional set of data which known as Big Data. By managing Big Data, tourism organisations could extract valuable insight from avalanche of information that could elevates them to a new dimension of customer experience and improves the way they interact with customer (SOCAP International 2013). Those who master this form of technology gain an abundant competitive advantage compare to competitors.

2.2 Smart City Characteristic

In marketing language, smartness is centred on a user perspective, which makes it more user-friendly than intelligent (Nam and Pardo 2011). Smart cities concept has typically been associated to technology embedded ecosystem that attempted to build synergies with their social components in order to enhance citizens' quality of life and to improve the efficiency of the city services (Egger 2013).

IBM defined Smart City as a city that make their system instrumented, interconnected and intelligent. Within this definition, instrumentation denotes that city activities are measurable by sensors that scattered around the city; interconnection means that every bit of a city are connected through ICT network both wired and wireless; and intelligence refers to predictive applications that have the ability to generate more accurate decisions (Komninos et al. 2013). Smart Cities have the ability to give intelligent response to various kinds of needs, including daily livelihood as well as city services and commercial activities that happen within the same time interval (Su et al. 2011).

A city could be categorised as smart when sustainable economic growth and high quality of life were achieved through investment in human capital, adequate level of government participation and infrastructure that support proper dissemination of information throughout the city (Caragliu et al. 2009). Thus, smart cities should base their smartness on three main pillars, namely: human capital, infrastructure/infostructure and information (Komninos et al. 2013). Human capital is the core element who actively participating in day to day activities and could potentially drive the city to be smarter (Bakıcı et al. 2013). In addition to human capital aspect, solid infrastructure in the form of optical fibre networks that covers the whole city is as important because it roles as city backbone of sensors installation (Komninos et al. 2013). Further, convenient access to an enhanced information flow for city stakeholder is deemed essentials to fuel their actions in

optimising city function and make it a better place to live in (Accenture 2011). Citizens of Smart Cities are empowered to understand the cost of living in real-time so they could make better decisions on how to allocate and effectively use the limited resources in the cities. Thus, the city should therefore directly involve citizens in the co-creation process of products or services (Bakıcı et al. 2013; Schaffers et al. 2011). To this end, Smart Cities are not only considered as the outcome of innovative process but also as innovation ecosystems that empower communities' co-creation for designing innovative living resulting in constant dynamic innovation and engagement with all stakeholders (Schaffers et al. 2011). Further, Boyd Cohen has developed Smart City Wheel as a tool to support the development of Smart Cities strategies as well as tracking their progress. Within this wheel, Cohen (2012) has defined few indicators for each of the smartness dimensions, namely (1) Smart Governance that relates with aspect of transparency within governance systems through modernisation of city administration by supporting data openness and public involvement; (2) Smart Environment which is related to energy optimisation 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 involve the quality of life which measured in terms of healthy environment, social cohesion, tourist attraction and availability of cultural and educational services (Baudouin 2012). These characteristics are built based on smart combination of endowments and creative yet knowledgeable citizens that make sound management of available resources (Giffinger et al. 2007).

2.3 Tourism Destinations

There are several viewpoints in defining tourism destinations. In regard with its geographical area, tourism destination defines as an area that selected by visitors which encompasses all necessary amenities such as accommodation, restaurant and entertainment (Bieger 2005 as cited in Buhalis 2000). Meanwhile, definition of tourism destinations could also stress beyond their geographical limit to the extent that depends on tourists' origin motivation (Luft 2007 as cited in Buhalis 2000). As denoted by United Nations, the meanings of destination are lies under tourists' perception of a place that motivates them to take the trip (Lamsfus and Alzua-Sorzabal 2013). Further, Buhalis (2000) refers to destinations as amalgams of tourism products and services which exclusively produced and offer to the potential customer as an integrated experience. The linkage between one tourism products and another at destination level is vital because of the nature of tourism industry which are combination of multiple components served in several touch points that perceived by the customers prior, during and after their trip (Soteriades 2012).

Successful destinations can be structured as the 6As of tourism destinations: (1) Attractions which can be natural such as mountain; artificial such as amusement parks; or cultural such as music festival; (2) Accessibility refers to the entire transportation system within destination that comprise of available routes, existing terminals and adequate public transportations; (3) Amenities characterise all services facilitating a convenient stay, namely accommodation, gastronomy and leisure activities; (4) Available Packages refer to the availability of service bundles by intermediaries to direct tourists' attention to certain unique features of a respective destination; (5) Activities refer to all available activities at the destination which mainly trigger tourists to visit the destination; and (6) Ancillary Services are those daily use services which are not primarily aim for tourist such as bank, postal service and hospital (Buhalis 2000). It is deemed important for destinations to properly maintain each of their 6As to be highly competitive in the industry. However, with consumers taking over the process of co-creation, destinations need to realise that conventional approach has become obsolete and they need to interconnect all their stakeholders to facilitate a dynamic co-creation process to increase destination competitiveness (Neuhofer et al. 2012).

3 Smart Tourism Destinations

Bringing Smartness into Tourism Destinations requires dynamically interconnecting stakeholders through a technological platform on which information relating to tourism activities could be exchange instantly. This integrated platform is having multiple touch points that could be access through a variety of end-user devices which will support the creation and facilitation of real-time tourism experiences and improve the effectiveness of tourism resources management throughout the destination at both the micro and macro level. 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. The ultimate aim is to utilise the system to enhance tourism experience and improve the effectiveness of resource management towards maximising both destination competitiveness and consumer satisfaction while also demonstrate sustainability over an extended timeframe.

There are three forms of ICT which are vital for setting up Smart Tourism Destinations, namely Cloud Computing, Internet of Things (IoT) and End-User Internet Service System (Zhang et al. 2012 as cited in Wang et al. 2013). The Cloud Computing services are designed to provide convenient way to access solid web platform and data storage through certain network. The use of Cloud Computing is going to reduce fixed costs and shift them into variable costs based on the necessities (Etro 2009). It also stimulates information sharing that is fundamental to undertake Smart Tourism Destinations project. For example, a sophisticated tour guide system could serve massive number of tourists without being actually

installed on any personal device (Zhang et al. 2012 as cited in Wang et al. 2013). Second, the IoT could support smart destinations in terms of providing information and analysis as well as automation and control (Chui et al. 2010). For example, chips embedded to entrance ticket allow tourism service providers to track tourists' locations and their consumption behaviour so that location-based advertising could be executed (Lin 2011). As for automation and control, the system could control visitor number within specific tourism sites by using variety of sensors in regard with each sites' carrying capacity (Mingjun et al. 2012). The third component of a smart destination is the End-User Internet Service System, which refers to number of applications at various levels supported by combination of Cloud Computing and IoT. For example, Barcelona had established Project LIVE that concerning on the creation of innovative hub for electrical vehicles. LIVE's charging points map could be accessed remotely via Apple's iPhone and Google's Android to check all the availability status of vehicles' charging points (Jung 2011). However, proper connectivity is the base enabler to run these three core forms of ICT in Smart Tourism Destinations. In this regard, it is important for the government supported by various stakeholders to maintain adequate network coverage within the city to avoid gap between commercially dense area and rural area.

Smart Tourism Destinations should also perform smartness by implementing appropriate tourism applications within Smart Cities' components as defined by Cohen (2012). A range of smart services can be seen on Table 1 which shows how 6As Destination Components (representing destinations element) and Smart Tourism Destination Dimensions as derivate from Cohen's Smart City Dimensions (representing smartness element) could be combined and possibly generate tourism applications with each of its utility function to be implemented in Smart Tourism Destinations.

Progressing towards the smartness concept, Stockholm collects real-time information from scattered sensors in the city and processes them in order to provide accurate city information through end-user devices; which reflect the use of ICT as a predictive tool to implement a smarter way of managing Tourism Destinations (Achaerandio et al. 2011). Broadly foreseeable changes caused by smartness immersion in tourism destinations build characteristic of Smart Tourism Destinations, though it triggers different outcome for each stakeholders as summarised in Table 2.

Regardless to say, creating Smart Tourism Destinations from scratch requires leader to constructively engage with local to ensure community participation and also regularly monitor the plan. The flagship of the transformation to Smart Tourism Destinations is destination-wide access to real-time information. To achieve this, destinations must undertake open access through integrated public-controlled operating systems to offer unrestricted data to all citizens and avoid vendor monopolies (Zygiaris 2013). Tourism authorities should ensure that any information generate from every development of new application should be made openly available subject to their commercial and legal agreement without unreasonable additional cost (Reischl 2013). There are two main information sources: (1) information coming from the city resulting from sensors, city elements and

Table 1 Tourism applications in smart tourism destinations

No.	Tourism applications in smart tourism destinations	Utility function	Destination components (Buhalis 2000)	Smart tourism destinations dimensions (Cohen 2012)
1.	Augmented reality (AR) enables visitors to experience digital recreation of tourism sites and time travel (Chillon 2012)	Interpretation	Attractions	Smart people, smart mobility
2.	Vehicle tracking system provides a real-time information of transport network and could be distributed to end-user devices (Arup 2010)	Planning	Accessibility	Smart living, smart mobility
3.	Hotel should able in predicting energy demand for building and perform energy audits based on their environment management (Metric Stream 2013)	Sustainability	Amenities	Smart environment
4.	A multi-languages application that provide range of services such as electronic travel guide which also offer numbers of available packages for tourists (Jordan 2011)	Guidance	Available packages	Smart people, smart mobility
5.	NFC tags and QR codes to access information about nearby points of interest through mobile devices (GSMA 2012)	Proximity marketing	Activities	Smart mobility
6.	Tourists are able to register their complaints through a Complaints Management System that supported by various ICT channels such as SMS or mobile applications which could directly route them to appropriate officials (Metric Stream 2013)	Feedback	Ancillaries	Smart living

Table 2 Smart tourism destinations characteristics

No.	Stakeholders	Characteristics of outcome
1.	Tourism organisations	• Function as smart hub that coordinates all relevant information and makes it easily accessible for users to access real-time information • Digitisation of core business processes • Optimise their energy use • Engage with local communities, tourists and government in co-creating tourism experience • Organisational agility, speed decision making and responsive to customers' needs based on just-in-time insights • Precision targeting and personalised service
2.	Governments	• Information governance that support data openness • Regulate data privacy • Establish Public–Private Partnership
3.	Local residents/local communities	• Constantly connected • Sufficiently creative and empowered • Technology savvy • Citizen journalism • Actively involved in developing smart heritage/e-Culture
4.	Tourists	• Well-connected and well-informed • Active critics and buzz marketers • Demand highly personalised service • Engaged both socially and technologically • Dynamically discuss through social media • Co-create experience • Contribute to content • Utilise end-user devices in multiple touch-points
5.	Environment	• Interconnected through Internet of things • Presence of cloud computing services • Innovation ecosystem • Sensor networks throughout the environment • Combine digital information and social contexts which will augment geophysical reality • Interoperable social platforms

Source Adapted from (Hedlund 2012)

Open Data; and (2) information coming from the citizens and visitors as digital footprint from their social media activities. Users could use this information to identify problems as well as customised potential solutions to overcome those problems.

To maintain rapid growth of technology, it is suggested that Smart Tourism Destinations are best use Living Labs methodology as tools for learning, conducting tests and research before the implementation of new technologies and services in large-scale real-life environments. As a promising method, Living Labs not only give insights for future markets but also foster innovation and product improvements. Through Living Labs methodologies, numbers of people are selected and being involved iteratively over a co-creation process to capture the

market (Almirall et al. 2012). Although tourism often incorporates elements of spontaneity and exploration, seems that tourism industries in general are assuming that uncertainty reduction is preferable. In fact, tourists might actually seek out risk and opportunity to get lost and explore. To this end, some intelligent systems are now being developed in accordance to stress the importance of inspiring rather than precisely matching tourists' preference (Mahmood et al. 2008 as cited in Gretzel 2011).

Further, Public–Private Partnership (PPP) is essential when running a Smart Tourism Destinations initiative. The operational advantages are that PPP fosters efficiency, support creativity and induce innovation to flourish (Heeley 2011). Private companies are not only offer innovative design, but also project management skills and risk management know–how (Nisar 2013). The successful implementation of Smart Tourism Destinations could also attract Foreign Direct Investment (FDI). Since these investments tend to last a long time, getting the right infrastructure in place shapes a destination for the next decades and ensuring their sustainability. While this may sound more difficult, it is actually more cost-effective in the long run (Reischl 2013). However, attracting private capital is not always a good thing. Destinations should address the risk that private could potentially dominate the field and public sectors are merely co-opted in a marginal position (McCann 2011 as cited in Vanolo 2013).

Smart Tourism Destinations is not free from political influence as it opens certain social options and closes others (Winner 1978 as cited in Gretzel 2011). In this regard, measuring the performance of destinations by attributing a higher score to specific settings could be used as a political tool considering that charts are politician's favourite to justify their political rationales. Further, the danger of using ranking as benchmark for measuring success is to subsequently develop policies based on a single model to be applicable everywhere with limited local adaptation (McCann 2011 as cited in Vanolo 2013).

It is necessary to point out that there is only little room for the technologically illiterate and the poor within destinations. Citizens and visitors are considered responsible for their own ability to adapt on this rapid development of technology. Thus, it is recommended that destinations not only focusing on exploiting the use of new technology but also educate their citizens and visitors on how to best use this new technology through series of learning method (Komninos et al. 2013).

To some extent, smartness concept sparks the idea of social control that makes intrusion in someone's private life becomes common. Through intelligent system, Smart Tourism Destinations capture information about users and their activities that could be highly personal, including their actual physical location which could be considered as potential threat to privacy (Michael et al. 2008 as cited in Vanolo 2013). Evaluation of intelligent systems in tourism is then needed to assess not only their ability to help but also their potential to harm users (The Economist 2013). This issue has raised significant ethical concerns. Many techniques have been developed to protect individual privacy, namely noise addition, micro-aggregation, rank swapping, rounding, etc. The main purpose of these techniques is to distort data in order to avoid direct linkage between individual and their

private information. The next problem that comes up upon this approach is finding the right balance between information loss and disclosure risk (Martínez-Ballesté et al. 2013). Hiring Trusted Third Party (TTP) is also one solution to hide users' real identities. Since most of the destinations are using video surveillance systems as sensor to supply real-time information on public transportation and traffic situation, TTP could take advantage of several users being under the same location to cloak their actual locations so that the server will not be able to correlate users and their actual locations (Martínez-Ballesté et al. 2013).

4 Conclusion and Limitations

Smart Tourism Destinations cored in massive tourism resource data centre, supported by Internet of Things and Cloud Computing, focused on enhancing tourists experience through intelligent identification and monitoring. The real sense of Smart Tourism Destinations is to focus on tourists' needs by combining the ICT with casual culture and tourist innovation industry in order to promote tourism service quality, improve tourism management and enlarge industry scale to a broader extent (Huang et al. 2012). The priorities of Smart Tourism Destinations construction are to enhance tourists' travel experience; to provide more intelligent platform both to gather and distribute information within destinations; to facilitate efficient allocation of tourism resources; and to integrates tourism suppliers at both micro and macro level aiming to ensure that benefit from this sector is well distributed to local society (Rong 2012). Most of the time, tourists only have limited knowledge and low awareness on destinations they visit. They do have different needs and characteristics. Developing crowd-sourced applications by using tourists input could give valuable insight to destinations in capturing tourists' demand and tourist complaints in timely manner (Haubensak 2011).

While this paper has shed some light on the Smart Tourism Destinations literature, it also has limitation. Case studies approach might be suitable to further investigate best practice of Smart Tourism Destinations implementation and to generate more in-depth understanding within this subject. Further research is needed to expand the theoretical contributions of this research as well as to validate the findings.

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