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Barriers to Bangkok as a Smart Destination with Internet of Things Technology

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Abstract

Information and Communication Technology (ICT) offers the opportunity to design smart tourism destinations. A smart destination can integrate a variety of technologies to enrich the tourism experience. The Internet of Things (IoT) is a platform that can synergize ubiquitous sensing technologies and networks with physical components to enhance smart tourism destinations. Although building a smart destination and tourism promotion are major strategic goals of Tourism Authority of Thailand 4.0 (TAT 4.0), Bangkok has not yet developed as a smart destination with new IoT technology to enhance a tourists' travel experience. This research identifies the barriers to Bangkok as a smart tourism destination by focusing on the readiness to use smart IoT technology and related management issues. There are five major barriers for Bangkok to be a smart destination: 1 the lack of a smart environment, 2 available valuable data, 3 resource competency, 4 privacy and safety, 5 strategic management issues related to policy consistency stability, an effective business model and the engagement of stakeholders. The reduction of these barriers could assist Bangkok to develop a more effective design for a smart destination.

Keywords

Barriers, Bangkok, Internet of Things, Smart Destination

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Introduction

In a digital world, the tourism industry is now experiencing an enormous transformation resulting from the development of information and communication technology (ICT). ICT can be deployed to build a smart destination by synergizing with other systems as an ecosystem, including social and safety factors in order to enhance the tourist experience and to improve the efficiency of tourism services (Egger, 2013). Smart tourism focuses on providing IT-enabled services to attract tourists who are short-term citizens of the destination smart city (Lamsfus & Alzua–Sorzabal, 2013).

For a smart destination, ICT plays an important role in attracting and facilitating tourists. The technology of Internet of Things (IoT) has significant capabilities to provide real-time interactions and information to tourists. IoT technology can be deployed to build a smart destination.

The growth of IoT is rapid in many sectors. The total global economic value-added for the IoT market will be 1.9 trillion USD in 2020, benefiting many industries, such as, healthcare, retail, and transportation (Gartner, 2013). Cisco estimates that the global IoT market will generate 14 trillion USD in profit over the next ten years (Bort, 2013). In the context of tourism, tourist behavior is changing from just planning a trip to an integrated experience using travel information via websites and social media channels. IoT is one important component of building a smart tourism destination. Notably, the application of smart tourism technologies can change tourist experiences (Buhalis & Law, 2008; Connell & Reynolds, 1999; Koo, Gretzel, Han, & Chung, 2015). The IoT system can enhance a smart destination in terms of providing and analyzing information as well as automating control of tourist activities and behaviors (Chui, Loffler & Roberts, 2010; Gartner, 2013).

Bangkok faces strong competition from other smart destinations like Singapore, Tokyo and Seoul (Mastercard, 2017). Based on international overnight arrivals, Bangkok was ranked among the top ten Asia Pacific destinations, followed by Singapore, Tokyo and Seoul. The Thai government has set up the Thailand 4.0 initiative including Tourism Authority of Thailand 4.0 (TAT 4.0) to increase the sustainability of the Thai economy in the next decade. One of the information technology development plans is to adopt IoT in the tourism sectors so that the real-time operations/services and data can be provided to related parties for high value operations/services (MICT, 2016). Thailand has invested in technological infrastructure to support the implementation of IoT technology for tourism services (Ho, 2017). The implementation of smart destinations – Phuket, Chiangmai, and Bangkok – are in progress. There are many studies focusing on smart destinations (e.g. Boes et al. 2016; Buhalis & Amaranggana, 2014; Gretzel et al. 2015; Lamsfus & Alzua-Sorzabal, 2013), but there are very few that put an emphasis on policy makers who have a significant influence on improvements in IoT infrastructure, technological platforms, and other resources to develop a

smart destination. This research focuses on policy makers and IT expertise and hospitality involved in setting policy and developing the infrastructure of Internet of Things that can support Thailand as a smart destination. The last part of this paper will discuss barriers to Bangkok as a smart destination based on the IoT technology.

Theoretical background

Smart Destinations

A tourism destination is defined as a place or city chosen by visitors which includes all necessary services and products (Buhalis, 2000). Soteriades (2012) found that the combination of multiple components of customer service prior, during and after the trip is important. To support customer service, tourism products and related services should be integrated through different channels. Neuhofer et al. (2012) suggested that the traditional tourism destination has become obsolete and needs to connect with all stakeholders to facilitate a dynamic co-creation of destination to enhance destination competitiveness through a technical platform. López and García (2013) defined a smart destination as an innovative space with cutting-edge technology infrastructure equipped with an intelligence system which can capture information in real time. This facilitates the visitor's interaction with the location. It enhances of decision making for the destination managers, and increases the quality of tourist experiences (López & García, 2013).

In the digital society, tourist behavior is changing. They plan their own trips and share their travel information via websites and social media channels. Tourists require a smart information system, intelligent tourism management, and smart location analysis and logistics (Wang et al., 2016). Smart destinations integrate networked systems of stakeholders to facilitate real-time services, exchange information, and enhance tourism experiences (Baggio & Del Chiappa, 2014). Accessibility is an important feature of a smart destination (Arup, 2010; Buhalis, 2000; Chillon, 2012; GSMA, 2012; Metric Stream, 2013).

A smart destination integrates technology in different platforms through end-user devices in multiple touch-points to provide responsive services to tourists. This requires the engagement of many stakeholders to develop and utilize the system to improve the effectiveness of tourism management (Buhalis & Amaranggana, 2014). Embedded ICT within the destination environment can enhance tourist experiences and destination competitiveness. Relevant technologies that support a smart tourism destination are cloud services, the IoT, and an end-user Internet service system with a variety of applications (Wang et al., 2013).

Internet of Things

Due to the advancement of Internet technology, the development of Internet of Things (IoT) expands opportunities to connect the physical world with the cyber world. The major concept of IoT is a communication device and an application (Mingjun et al. 2012). The key concept behind IoT is a real-time interface among real world objects or devices that connect to the Internet. The IoT is based on a communication device and an application (Mingjun et al., 2012). The development of the IoT creates platforms and applications that can combine visual tags of physical objects and Near Field Communication (NFC) devices (Borrego-Jaraba et al., 2011). It can transfer a range of data using a participatory sensing system. The working infrastructure of IoT for a smart destination consists of sensing and control, networking, resource management, information processing, and application for the end-users (Shin, 2014).

In the tourism context, the IoT is a new important technology for building a smart destination. The emergence of Cyber-Physical Systems (CPS) generates an impact on designing a smart destination for tourists. The application of smart tourism technologies can change the tourist experience (Buhalis & Law, 2008; Connell & Reynolds, 1999; Koo et al., 2015). The IoT system can be applied to create smart destinations in terms of providing and analyzing information, and automating and facilitating tourist activities and behaviors (Chui et al., 2010; Gartner, 2013). Tourism service providers can develop and extract a multidimensional set of valuable data, which is known as big data, to create better insight into tourists, to improve services, and to provide related information to tourists (healthcare, safety, etc.). Tourists can use their smart devices to explore a destination and plan their travel based on data analytics.

Barriers to smart destination implementation

Case studies of smart destinations in Barcelona, Spain; Helsinki, Finland; and Amsterdam, Netherlands showed that the integration of the smart environment of new IoT technology within a tourism destination is not sufficient for becoming a smart tourism destination. Becoming a smart tourism destination requires leadership, vision, and strategic management. Understanding the smart tourism destination as an ecosystem is essential and a vision and a clear set of goals for innovation are key facilitators for developing smart tourism destinations as a collective integration of resources for value co-creation by all actors within the smart tourism destination ecosystem (Boes et al. 2016).

Buhalis (2015) suggested that to implement a smart tourism destination successfully requires a commitment to open innovation supported by investments in human and social capital, and sustained by participatory governance in order to develop the collective

competitiveness of tourism destination, and to enhance social, economic and environmental prosperity for all stakeholders.

This study considers the limitations and barriers of information technology and smart tourism destinations. The barriers to smart destination implementation relate to a low innovation ecosystem, unavailable intelligent information and ICT ecosystem, and an ineffective knowledge management culture (Boes et al., 2016; Kim et al. 2010; Ottenbacher, 2007). Without strong a business model, high commitment of management support and close engagement with related partners there are major barriers (Boes et al. 2016; Dahlander & Gann, 2010; Dijkman, Sprenkels, Peeters & Janssen, 2015; Rotchanakitumnuai, 2008). In addition, insufficient IT competencies, a lack of privacy, and security concerns are barriers to smart destination implementation (Boes et al. 2016; Gretzel et al. 2015; Koo, Yoo, Lee & Zanker, 2016; Mistilis & Gretzel, 2013; Rotchanakitumnuai & Speece, 2003).

Methodology

The research on barriers to smart destination implementation with IoT is not very extensive compared to smart tourism destination development. There have been few studies exploring the impact of ICT on enhancing smart destinations and tourists' experiences, and these have been mostly in the Western context. Few studies have covered Asia, especially a developing economy like Thailand. This research is a qualitative exploration of the viewpoints of policy makers and those with expertise in the barriers to Bangkok as a smart destination with Internet of Things technology. At the early stage of a smart destination, a qualitative study can provide deeper details and obtain better understanding of the barriers to smart destination.

Face-to-face in-depth interviews were conducted with 15 respondents with expertise in information technology, communications, and policy setting. They were selected to cover three groups of respondents related to public-private partnerships in building a smart tourism destination (Buhalis & Amaranggana, 2014). Purposive sampling was employed to select respondents based on understanding the topic being studied. The purpose was to focus on individuals who have a unique, different or important perspective on the phenomenon in the research questions (Mason, 2002; Robinson, 2014). This included respondents from governments, tourism organizations, business, and academic sectors, such as policy makers, smart application developers, top executives in mobile business development, and academic experts in digital business and smart technologies. A semi-structured interview method was employed in this study. Respondents were asked to consider barriers that have impact on designing Bangkok as a smart destination. The literature review was the source for the questions. Qualitative content analysis was used for comparing similar interpretations from

the respondents in order to categorize and summarize the barrier issues. Some interesting quotes are highlighted in the discussion. Table 1 shows the profile of respondents.

Table 1 Respondent Profile

Sector (Respondent)	No. of Respondents	Position
Government (G1-6)		
- Science and Technology Agency (G1)	1	Top Executive
- Science and technology Agency (G2-3)	2	Director
- Academic (G4-6)	3	Professor/Associate Professor
Tourism Organizations (T1-2)		
- Tourism Authority of Thailand (T1)	1	Top Executive
- Department of Tourism (T2)	1	IT Director
Business Sectors (B1-7)		
- Logistics (B1-2)	2	Manager
- Mobile/Internet Service Providers (B3-4)	2	Top Executive and Manager
- Hotel (B5-7)	3	Top Executive and Manager

Results and Discussion

The analysis indicates five barriers for Bangkok being a smart destination including the lack of a smart ecosystem, valuable information, government strategic implementation, professional competency, and privacy and security.

Lack of Smart Ecosystem

As the capital of Thailand, Bangkok has the best technology infrastructure with 4G. Everyone can be connected everywhere in Bangkok through the Internet. Most people use their smart devices for searching and downloading information and photos. A smart ecosystem has not yet been facilitated. Technology embedded environments and end-user devices for a variety of touch points have not been implemented. To become a smart destination, smart applications with data from the IoT have to be turned into valuable information for the tourism sector to be developed. The following statements highlight these issues:

> The strategic direction of smart destination implementation has not been clearly set although the original Bangkok project is focused on the Yothee-Rathevi area, which comprises many hospitals and government innovation agencies. The Thai government is developing this area as the prototype for a smart city. A Smart Medicine

> and Smart Government center have been created. This project has not yet been implemented completely. The smart ecosystem for the IoT to support Bangkok as a smart tourism destination is only at an initial stage (G2).
>
> There is a limited access into some content due to required authorized access or paid contents. Most people are not knowledgeable about the application of information from IoT for tourists. It is important to publicize how to utilize the information and what benefits the people obtain (B3).

Other major issues include heavy traffic, inadequate tourist support applications and limited tourism information. The integration of IoT with physical infrastructure or smart devices including touch points for tourists has not been implemented. This barrier would definitely have a negative impact on the smart destination readiness of Bangkok. For example, the top executives of tourism and government sectors highlighted the importance of this barrier:

> The problems are traffic, inadequate convenient applications, and limited tourism information. Bangkok needs to solve the traffic issue (T1).
>
> Tourists should have applications that are easy to use and gain the required information so that they would come to travel in Thailand with confidence, convenience and safety. Examples of those applications are mapping, real-time location tracking, and translation applications (T2).
>
> Another advantage of IoT integrated into physical infrastructure is that it allows us to know the real-time information. In other countries, information security is normal, so we need to have an organization that profoundly understands this issue and defines a security level suitable for the capability of IoT technology to tourists (G3).

Valuable Information Concern

Valuable information is a major concern. The importance of IoT technology implementation is the value of information but there is no business model for smart destinations or smart tourism applications for this. It is important to publicize how to utilize the information and what benefits the tourists obtain. Generally, the contents should be free to access. Some contents in the business sector can be fee or free for particular groups. The volume and openness of data access should be improved. Moreover, a business model and good ecosystem service system (e.g. sales, logistics, value added service, and suppliers) has not been determined. These rely on the information from IoT to generate significant income to tourist enterprises. Currently, the data in devices are difficult to understand for tourists. The conversion of data into understandable and valuable information is essential to enrich the tourists' service experience. The following statements demonstrated the viewpoints from the business sector:

> The government should have a clear policy in this matter and provide a budget to improve touch point infrastructures and IoT supporting devices in tourist attractions so that real-time information can be provided and used for enhancing travel experience to tourists and related service providers such as logistics and shopping area (B5).

> We have to think about building a business model if Bangkok will become a smart city for tourists. At this moment, we cannot identify what benefits the information businesses and government have gained from IoT. Most people use their smart devices normally for searching information and taking photos without value creation. The readiness of contents seems to be an issue (B4).

> To be a smart tourism destination, we have to use information or data gained from IoT for business analysis and doing business as well. When people utilize IoT, we will analyze the data obtained for business operations and government management. The data from tourists who use IoT applications on their smart devices can be analyzed. For instance, if I own a taxi business, I could send my taxis to those locations to serve the tourists. I can manage resources properly and have more income. Then, I am willing to pay for this information (B2).

Weak Government Strategic Implementation

Overall, the respondents had somewhat positive attitudes about the Thai government's strategic direction for the smart destination. Currently, Phuket is the first smart city project for tourists because of its location, technology readiness, and notoriety as a famous international tourist destination. The IoT City Innovation Center was established in January 2016. However, there have been no concrete Smart IoT applications implemented to demonstrate positive result in Bangkok. At this moment, people do not clearly understand the IoT. This concept has not been promoted in cooperation with relevant sectors, for example other related government agencies, business, and society overall. One respondent from the tourism sector mentioned that:

> Nothing is concrete at this moment. We have just determined that there will be 5 smart cities within 3 years. Phuket and Chiangmai will be the pilot projects, and Phuket will be the first smart city. Nevertheless, the Internet of Things needs integration of infrastructures and security (T2).

Executives from business and tourism sectors are more concerned about the government policy's lack of collaboration with related stakeholders to enhance the service value chain or share knowledge for value co-creation with a smart tourism service ecosystem, as shown in the following viewpoints:

> The government has defined the strategic plan but has not had a clear implementation policy, especially the involvement of related stakeholders to develop a smart city. If the government creates no constraints or policy limitations, I think my company is ready to play a role to support IoT technology for building Bangkok as a smart destination (B4).

> The government promotes the smart city concept for the country and society, not for the business sector, so it is less attractive for entrepreneurs and business owners. At this moment, some businesses do not clearly understand about the smart city or smart destination concept. When they comprehend the concept, this initiative will take place (G5).

> We do not see the business model for Bangkok's smart destination from the government. As the result, the collaboration among related sectors is low and the progression of Bangkok smart destination development is uncertain (G6).

In addition, one executive from the government sector indicated that the political instability and frequent changing of the Ministers' responsibilities strongly affects smart city implementation as planned. Leadership with expertise and commitment to change is still in doubt.

Lack of smart design professionals

A smart destination should be developed to meet the needs of tourists. Policy makers, investors and business decision makers or top executives in the tourist sectors are the key persons who play an important role in this matter. At this moment, the lack of professional competencies in smart destination application development is a major concern. The business model of the smart destination should be clarified so that the competencies can be mapped with the appropriate requirements to provide effective smart destination implementation for international tourists. These include content related to the quality of life and location-based information related to specific destinations. Examples of quotes indicating this barrier are:

> Thailand lacks the human resources with expertise in application development related to the smart destination. In addition, the Thai government does not have a strong initiative in smart tourism development. The government has announced to the public to propose start-up projects for smart destination development. It may be too late for these projects.(G5)

> Because of the lack of an appropriate business model of the smart destination with IoT technology, we are not ready because there is a wide range of this technology. In terms of application and infrastructure development, if the government is not ready, outsourcing of IoT development for the smart tourism applications is important in this early stage. We need to have smart people who have technological knowledge and are capable of using advanced technologies. Moreover, many organizations do not have IoT

knowledge, so the government needs to demonstrate how IoT helps them increase their performance and enhance tourist experiences (B6).

Privacy and security

Privacy and information security are major concerns. Most respondents agreed that a smart destination should have strong security protection. Open access threatens privacy and is a source of viruses for systems and devices. In other countries, information security is assured. An organization that guarantees security and privacy protection is required for Bangkok to insure itself as a smart destination. The following statements support this issue:

> In other countries, information security and the protection of privacy of tourists are normal. Smart people with technological knowledge and capability of using technologies are important (G4).

Validation with Triangulation

The content analysis indicated five major barriers. These are a lack of a smart environment, valuable data, resource competency, privacy and safety, and strategic management of smart destination issues related to the business model of smart destination design, engagement of stakeholders, and management stability. The consistency of this research findings was validated by using triangulation of theory/perspectives and cases (Carter et al. 2014). Theory/perspectives triangulation was checked to examine and interpret the result of past studies of smart destinations (Table 2). The results are consistent with past studies (Bulharis & Amaranggana, 2014; Gretzel et al. 2015; Kaur & Kaur, 2016; Lamsfus & Alzua-Sorzabal, 2013). For instance, Bulharis and Amaranggana (2014) suggested issues of smart tourism components including development of smart technology platform and applications, interconnected with Internet of Things/innovation ecosystem, public-private partnerships and interoperable platforms and co-creation, role of government support and political influence, support information governance for data openness and regulate data privacy, and educate knowledge of new technology to human resources (Table 2).

Table 3 showed the triangulation of cases applied to compare with different assessments of smart destinations including Barcelona, Spain; Helsinki, Finland; and Amsterdam, Netherlands (Boes et al. 2016). In addition, the relationship of smart destinations with the competitiveness of Spain as the world's number one destination for holiday also supports the validation of this study (Segittur, 2015) (Table 3).

Table 2 Results Validation with Theory/Perspectives Triangulation

Source	Results from past studies (Keywords/Phases)
Kaur and Kaur (2016) (Title: Internet of Things to promote tourism: An insight into smart tourism)	● Smart Internet of Things technology and network and data applications ● New business model of smart destination management ● Trained human resources ● Security and privacy concerns of customer data ● Collaboration with related stakeholders
Gretzel et al. (2015) (Title: Smart tourism: Foundations and developments)	● Smart ecosystem integrating new digital technology, software, and network to provide real-time information ● Smart application with advance big data analytics ● Smart business model design with customer value creation, value network, resources and capability, public-private-consumer collaboration, and strategic decision
Buhalis and Amarranggana (2014) (Title: Smart tourism destination)	● Smart technology platform and applications ● Interconnected with Internet of Things/innovation ecosystem ● Establish public-private partnership/Interoperable platforms and co-creation ● Government / political influence ● Information governance that supports data openness and regulate data privacy ● Educate knowledge of new technology
Lamsfus and Alzua-Sorzabal (2013) (Title: Theoretical framework for a tourism Internet of things: Smart destinations)	● Smart environment of broadband networks that support intelligent smart tourism applications using Internet of Things ● Provide full coverage of the characteristic tourism products and services to improve and make competiveness of a destination sustainable in time

Table 3 Results Validation with Triangulation of Cases

Source	Result from case studies (Keywords/Phases)
Boes et al. (2016) (Title: Smart tourism destination: Ecosystem for tourism destination competitiveness)	● Innovation of smart technology ecosystem, data and user-driven innovation applications with open data to support the needs of tourists, such as Internet of Things, big data ● Value co-creation for competiveness/ public-private-professor-people partnerships ● Human capital with knowledge of smart destination design ● Strong leadership and determination of authorities to implement smartness successfully e.g. policies, change management
Segittur (2015) (Title: Smart destinations: Key points for competiveness)	● Technological innovations to manage smart tourism such as Internet of Things, machine to machine, big data, ● Innovation – rethinking of the entire tourism sector with new models of tourist destinations and collaboration of related parties ● Open access of data to tourists/improve security management ● Leadership in the smart destination implementation for enhancing sustainability ● Training, collaboration and knowledge sharing

Managerial Implications

The ICT advancement of Thailand is moving at quite a good speed. This supports the implementation of IoT technology to facilitate Bangkok as a smart destination. However, there are many barriers to implementation success. The first issue is that Thai government policy (Thailand 4.0 / TAT 4.0) does not match the smart destination strategy to include technologies that are essential to the functioning of a smart tourism ecosystem and data emerging from these technologies are the driver for new business models of smart destinations (Boes et al. 2016). For IoT applications, the Thai government has not fully facilitated these applications through investment in technology infrastructure. As mentioned by the interviewees, technology embedded in IoT environments and end-user devices in a variety of touch points have not been delivered, applications to enhance the tourist experience and real-time data for tourists are not available. The business model of the smart destination should emphasize the exchange of data, resources, and the co-creation with the related stakeholders. Collaboration with other stakeholders to develop a smart service

ecosystem is essential, especially with government, tourism, logistics and information security agencies. Smart information generated from IoT applications needs to be developed to provide the info-structure for a better service experience for tourists and value creation in related businesses. For example, Spain's smart destination initiative provides applications that can be used for tourist route planning, scheduling, booking hotels, and the tourists' demand management of particular tourist locations.

To improve the professional competencies related to smart design, cooperation with the business sector can create the capacity development needed for the implementation of smart destinations. Political uncertainty and lack of organizational agility are major barriers to realizing the smart destination goal of the Thai government. A strong project champion for Bangkok's smart destination project with commitment and compensation would be important to alleviate this issue.

The best business model for a smart destination should be based on public and private sector collaboration with integrated services and applications. Examples of those applications are location tracking, emergency assistance, and translation applications. Bangkok should implement electronic public safety services. This requires smart people who have technological knowledge and are capable of using IoT technologies. The transparent intelligent governance of data privacy and security has to be specified to build trust in the applications of the smart destination platform. In addition, it is essential to adopt mobile-based solutions and services with IoT technology to ensure that the Bangkok city of the future is safe and to improve the image of security for tourists.

For cities in Southeast Asia seeking to be smart tourism destinations, innovative solutions and integration requires involvement with related stakeholders' (e.g. government, telecom, and tourism/hospitality enterprises). This partnership could also be the formulation for tech-cognoscenti professionals and IoT solutions suitable for tourism and hospitality operations. The mutual benefits of faster, more personalized and flexible service from entry to exit would be attractive to the tourism and related industries to get involved to diminish the barriers to Bangkok as a smart destination with Internet of Things. This study contributes to other destinations in terms of barriers to developing Bangkok as a smart destination. Destination management in general requires resource stewardship, marketing efforts, organizing the various partners in the tourism value chain, information and connectivity, and face-to-face and e-service quality. Smart technologies and intelligent systems can integrate all these factors seamlessly for less cost and more value-added. Technology applications and ICT or IoT are only enablers of a smart tourism destination. This will require an innovative focus on new technology, policy, stakeholder engagement, and human resource capital investment.

Finally, this qualitative research has limitations. It has highlighted the barriers to Bangkok as a smart destination from the perspective of policy makers, top executives, and academics from related organizations. Future research may expand this study by investigating the international tourists' perspective through quantitative analysis to have a more in-depth understanding of the IoT implementation requirements for Bangkok to be a smart destination.

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