

SMART TOURISM TECHNOLOGIES: APPLICATIONS TO THE HOTEL INDUSTRY AND TOURISM

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ABSTRACT: *In modern times, technology permeates every aspect of human existence and is the single biggest element influencing people's lifestyles. People are using technology more and more, which has a big impact on how businesses run. As technology advances, new service forms and improved versions of current products and services are created. The potential benefits and downsides of smart tourism are briefly discussed after this. The research that is sorely needed to guide the development and management of smart tourism is further highlighted in this study.*

Keywords: *Tourism, Smart technologies, destination, memorable tourism experiences, hotel business.*

INTRODUCTION

The tourism sector in our country is developing year by year and is becoming one of the leading sectors of the economy. In these cases, it is appropriate to develop the tourism sector and fully demonstrate its potential.

Tourism and innovation are contradictory concepts. Tourism means recreation, travel, impression, and history. If we give different definitions, Tourism is understood as the departure (travel) of an individual from the place of permanent residence for a period of at least 1 year without engaging in paid activities in the destination (country) for health, educational, professional, or other purposes.

Besides, tourism is a small business, except for large infrastructure projects. In many cases, it is not even a business, but the activity of some selected people - guides, owners of guest houses, craftsmen, painters, and musicians.

No matter how serious the content of a trip to Uzbekistan is - whether it is historical, architectural, religious, or ethnic - it should not be forgotten that, in general, tourism belongs to the entertainment industry. People spend their vacations on it and calculate their budget accordingly.

Uzbekistan has a large number of historical monuments, we can give an example of the monuments of our regions such as Bukhara, Khorezm, and Samarkand, which are mainly visited by tourists.

Tourists mainly visit these regions in spring or summer. One of the problems when visiting these regions is that the climate is very hot during this season and our historical monuments are not fully explored. For this, transport, and restaurants should be compensated by increasing the number of hotels near these monuments, and the authors of the route and other participants of the tourism product should show comfort and inventiveness to cheer up the tired tourist and prepare him for the next day. Then it is not surprising that he wants to return to Uzbekistan again. There should always be new solutions and innovations everywhere. The demand for tourism services shapes the supply.

Information technology has helped hospitality businesses manage inventory, bookings, reservations, and customer data better. By implementing systems such as POS systems, property management systems, and CRM solutions, companies can track customer data, manage inventory levels, process payments, and handle bookings. Digital technology has been adopted by the hotel sector to offer visitors an improved and more streamlined experience. There are numerous ways that technology can enhance the hospitality experience, including mobile check-in and check-out and online booking platforms. For example:

1. Chatbots and Artificial Intelligence (AI) - Artificial intelligence (AI) chatbots are chatbots that use a range of AI technologies, such as natural language processing (NLP) and natural language understanding (NLU) to reliably comprehend user questions and match them to specific intentions, and machine learning to optimize responses over time.

2. Hotel Room Service in Automation - Automated room service allows guests to enjoy their favorite restaurant dishes without leaving their hotel room. This technology is enabled through app and QR code menu integration, allowing customers to access menu options from anywhere, anytime. Guests can quickly and easily order food, pay securely through the app, and even track the delivery of their order. This technology also allows hotels to provide guests with more personalized room service as they can customize bookings based on individual needs and dietary preferences.

Automated room service not only improves customer satisfaction, but also simplifies the process of ordering room service, saving time and labor costs.

3. Electronic Signage - Hotels and restaurants can display current information including menus, discounts, offers, and adverts using digital signage. With the use of digital signage, you can give visitors a more engaged and interesting experience by

enabling them to discover the information they need quickly and easily without having to consult menus or staff members.

LITERATURE REVIEW

The quantified-self movement is an emerging trend represented by a wide range of technological devices used for self-tracking, life-logging, personal analytics, and personal informatics. The concept of the quantified-self is based upon a new phenomenon wherein people voluntarily monitor their lives to better understand themselves (Lupton, 2014). Indeed, the notion of self-monitoring and tracking has a fairly long history that can be traced back to the 1970s (Kopp, 1988; Marcengo & Rapp, 2014). Since then, the concept of self-monitoring has proven effective in changing people’s attitude and behaviors, which is the goal of an embodied function in the sensing technologies (Choe, Lee, Lee, Pratt, & Kientz, 2014). The motivation behind this movement is to gain self-knowledge by tracking one’s life to “optimize” behavior through the process of quantification (Choe et al., 2014; Marcengo & Rapp, 2014). Having these motivations, quantifiedself participants have identified several benefits to this process including acquiring data about their lives, monitors and even challenging themselves, and eventually receiving feed- back resulting from comparisons between their actual life activities and goals, and potentially, other similar individuals.

Table 1 Quantified-self categories and measures

Categories	Example of potential measures
Physical states and activities	Body movement, temperature, calories used
Psychological and mental states and traits	Mood, happiness, emotions, self-esteem, thinking patterns, focus, attention, memory, stress, tension
Situation and environmental variables	Location, weather, noise, pollution, context, time of the day, travel, time intervals, places visit, distance traveled
Social variables	Influence, trust, interactions, people you are with, perceived safety

Importantly, the development of wearable devices (e.g., wrist bands and smart watches) which are made possible through relatively inexpensive sensors, easy access to the internet and cloud computing have completely changed the way people track their daily life by lessening the effort and the level of consciousness (Smarr, 2012; Swan, 2012, 2013). The concept of the quantified-self has been applied to a number of the different domains (e.g., health, fitness, and sport) and generates several different types of information about our lives. As can be seen in Table 1, people sometimes are required to have sufficient knowledge and additional effort to manually keep the record of their behaviors and feelings (e.g., steps taken, well-being, happiness, calorie intake, and the number of cups of coffee). However, there are a number of technologies which have the capacity to measure/track people in largely invisible ways (Marcengo & Rapp, 2014; Swan, 2012). These ‘smart’ products and devices now have the capability of somehow capturing or reflecting much of our surroundings and behaviors in real-time unobtrusively and unconsciously and interact with each other so as to gain a general ‘understanding’ of our current circumstances (Lupton, 2014); for example, driving habits and possible drowsiness can be monitored so as to alert drivers to be safe.

While self-tracking practices involve a continuous process of recording one’s life, the data does not need to be only quantitative, but can exist in any format such as a picture, video, online social media data, and audio (Augemberg, 2013). Thus, the collected data are both ‘structured’ and ‘unstructured’ depending on the device and method(s) of data capture.

In general, wearable technologies enable us to connect to the Internet, devices, and external environments through digital sensors (Lupton, 2014). Some of these devices can exchange stored information via wireless, NFC, and iBeacon technology so that people can have better conditions, be aware of the environment, and even encourage them to change certain behaviors (Swan, 2012).

Smart ‘shoes’, for example, can vibrate so as to point a person in the right direction so that he/she can enjoy the scenery; smart thermometers embedded within clothing can exchange information with other wearable devices in order to adjust the temperature in the room; or similar sensors embedded in a blanket can be used track sleep so as to assess the amount of time and the rhythm of deep sleep one has each night. Figure 1 illustrates some of the applications—wearable devices widely that have been used and which have the potential to measure travelers’ sensory perceptions as well as mediate their travel experiences.

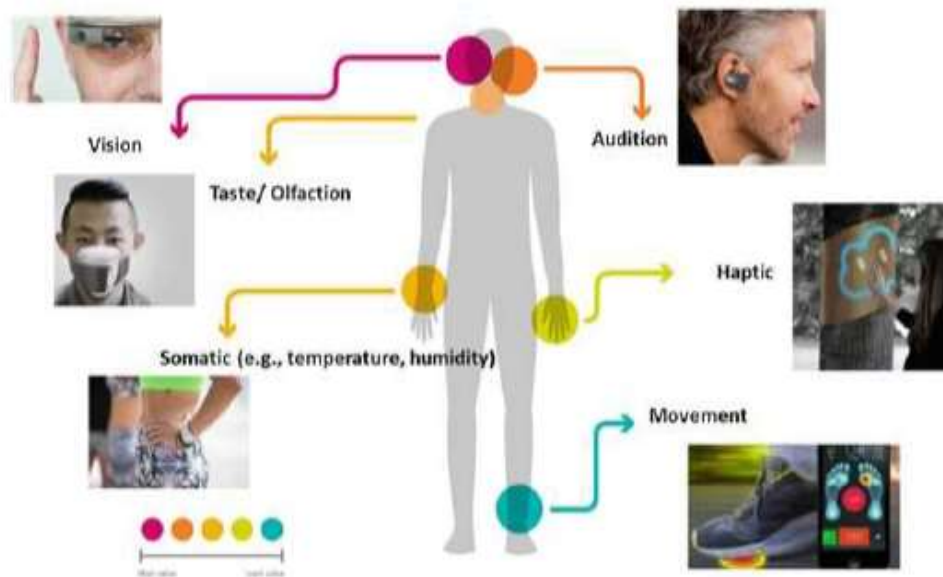


Fig. 1 Applications and wearable devices used for 'Quantified-Self' [adapted from Kim and Fesenmaier (2015)]

Further, the terms 'citizens as sensors', 'people as sensors', and 'collective sensing' have been coined to describe the nature of collective behaviors in terms of understanding context through social media, sensing technologies, and wearable devices (e.g., Goodchild, 2007; Sagl, Resch, & Blaschke, 2015). That is, many people actively use 'sensors' so that they can collect data about their surrounding environment as well as their physical/emotional states (and stored personal historical data) in real time, which in turn, generate huge volumes of data that greatly support individual decisions; for example, many outdoor enthusiasts collect and share information about birds, consistently collect weather information for local reporting, or search the skies of sightings for new phenomena (Goodchild, 2007). Within the context of tourism, managers in a theme park can now easily monitor the flow of incoming visitors at a particular time during the day via the users' location data from the mobile app or RFID tag-embedded ticket. Importantly, these new technologies result in large digital 'footprints' so that destinations 'track' this information in order to build a more comprehensive picture of each visitor as they travel (and make choices) within the destination 'ecosystem.' As such, the new technologies empower both individual travelers and destination management organizations by connecting the real world and the digital world (Sagl et al., 2015).

RESULTS

As travelers move from one place (or activity) to another along their trip journey (e.g., Gretzel, Fesenmaier, & O'Leary, 2006; Jeng & Fesenmaier, 2002; Yoo, Tussyadiah, Fesenmaier, Saari, & Tjøstheim, 2008), the changing situations and surrounding environments may cause changes in decision-making and behavior (Lamsfus, Wang, Alzua-Sorzabal, & Xiang, 2014). For example, travelers often renegotiate specific details of a trip when a flight is delayed for many hours; similarly due to physical fatigue, travelers might choose to postpone dinner, a walk through a park or simply going to a museum. Importantly, changes in context and subsequent behavior (in terms of spatial/temporal movements) can transform the way travelers interact and/or experience the destination (Kim & Fesenmaier, 2014; Yoo et al., 2008). As such, wearable devices enable us to track not only those physical behaviors from the external information they provide but also we can guess quite accurately what travelers are thinking and how they are feeling (e.g., emotional state) at a specific moment (Swan, 2012, 2013). Thus, it is argued that context is a fundamental aspect of the tourism experience and knowledge of travelers' context serves as the foundation for tourism design and development and from the destination marketers' perspective, understanding context and mobility empowers them with the ability to influence travelers' decisions in real time (Lamsfus, Martín, Alzua-Sorzabal, & Torres-Manzanera, 2015; Stienmetz & Fesenmaier, 2015). It is, therefore, argued that through the lens of the quantified traveler, there are many opportunities for tourism destinations to capture, understand, and interpret contextual information generated by wearable technologies connected to the Internet.

The data generated during our ordinary life offers huge potential to impact travelers' behaviors at the destination, and consequently, enhance tourism experiences at the destination. In recent years, several papers in the tourism literature (e.g., Gretzel, 2010; Pearce & Gretzel, 2012; Tussyadiah & Fesenmaier, 2009; Wang et al., 2012, 2014a) have shown that technological environments (e.g., smartphone, mobile devices) actively transform the way people travel across all stages of a trip by connecting the moment of tourists (i.e., the tourism journey) to their ordinary life. Further, they argue that the tourism experience is no longer clearly separable and distinguishable from everyday life. Although the basic motivation of travelling is to escape one's ordinary life and seek novelty, many travelers still want to do many of the same things they do in their daily life. For example, if people are on a diet they generally tend to continue within certain diet constraints (e.g., local cuisine, calorie intake, etc.); or if the traveler exercises daily, he/she might want to jog along a walkway, road or beach or workout

in hotel’s exercise room. In this regard, it is argued that the connection between daily life and tourism experience helps to increase the satisfaction of the tourism experience and, indeed, make their activity even more memorable.

Although the concept of quantified-self emphasizes the individual, it can be easily extended well beyond the scope of individuals to social groups (Swan, 2013). This is because people often share data about their lives (e.g., the level of happiness, walking distance per day) with others with the purpose of collective knowledge development, performance benchmarking and/or participation in social communities. Thus, it is possible that other entities such as actors, agencies, and organizations beyond the personal and private are able to access the information via such communities and/or cloud services and in turn, provide feedback (e.g., a solution, a discount coupon, etc.) in real time (Lupton, 2014). This can be tremendously important and become common in the near future in that recent developments enable us to learn something from others by sharing and comparing how each are doing individually and ultimately discovering the meaningful information and insights from the collective actions (Lupton, 2014; Swan, 2013). With these advantages, businesses may ‘repurpose’ these data to create commercial value, although the basic data created is based purely on personal activities with a voluntary engagement (Lupton, 2014). As these technologies are being increasingly integrated into everyday life through our phones, clothes and home appliances, travel and tourism can be seen as a field of logical extension of the concept of quantified self, particularly due to its potential applications for smart tourism development (see Fig. 2).

DISCUSSION

Smart Tourism refers to the convergence of information technologies, business ecosystems, and tourism experiences (e.g., Gretzel, Koo, Sigala, & Xiang, 2015; Gretzel, Sigala, Xiang, & Koo, 2015). Importantly, Gretzel, Koo, et al. (2015)

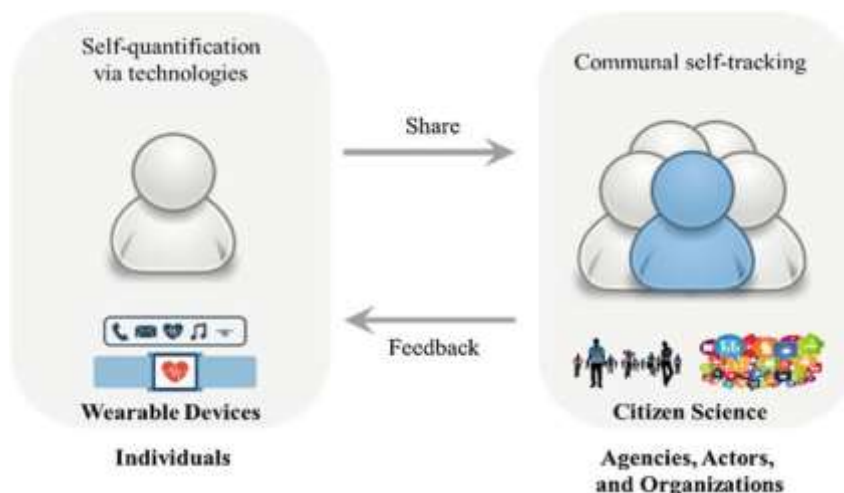


Fig. 2 Data sharing and feedback loop in the ‘Quantified-Self’ community

argues that the core technology of smart tourism are sensors and mobile devices which enable destinations to create the pervasive technological environments which destination marketers can use to anticipate travelers’ needs in real time so as to enhance their experiences and enable the sharing of one’s tourism experiences. Thus, they posit that smart tourism development requires destinations and companies to integrate personalization, context-awareness, and real-time monitoring through information collection, ubiquitous connectedness, and real-time synchronization into their management efforts (Gretzel, Sigala, et al., 2015; Neuhofer, Buhalis, & Ladkin, 2015). Within this context, it is further argued that the notion of the quantified traveler holds the key to understanding how today’s wearable devices and technologies contribute to the tourist experience and how they can be used to assist smart tourism development. Specifically from a service design and system development point of view the quantified traveler: (1) provides data for context-awareness, (2) connects with one’s historical data from everyday life, and therefore, (3) enables us to understand the traveler’s interactions with the environment.

Another key to smart tourism development lies in our understanding of how the traveler interacts with and within physical and social environments. Technologies (e.g., wearable devices, sensors, and other agents connected to the internet) have an important but implicit role in facilitating the interaction between travelers and their environment (see Fig. 3). Indeed, technologies have been considered as an effective instrument to create, support, and reinforce tourism experiences by providing information, broadening the choice of traveler behaviors, and enabling travelers

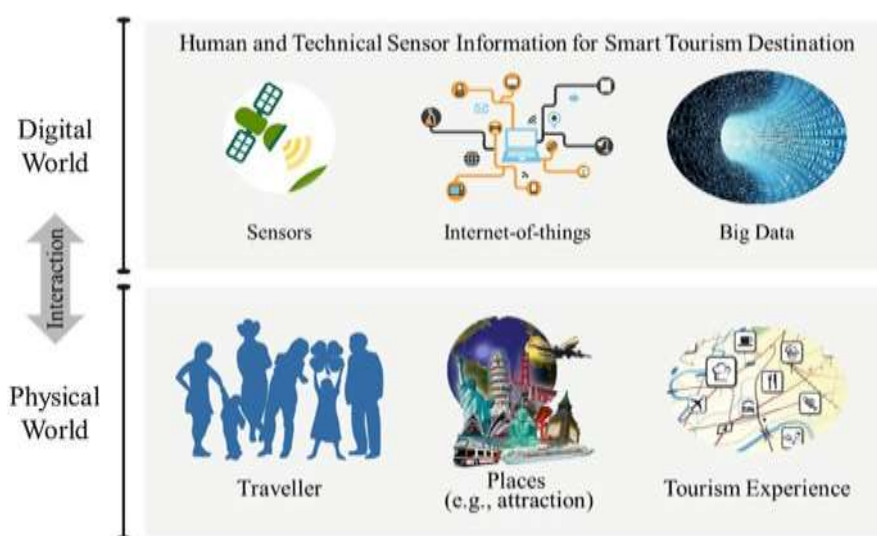


Fig. 3 Context-enriched human and technological sensor information for Smart Tourism Destinations

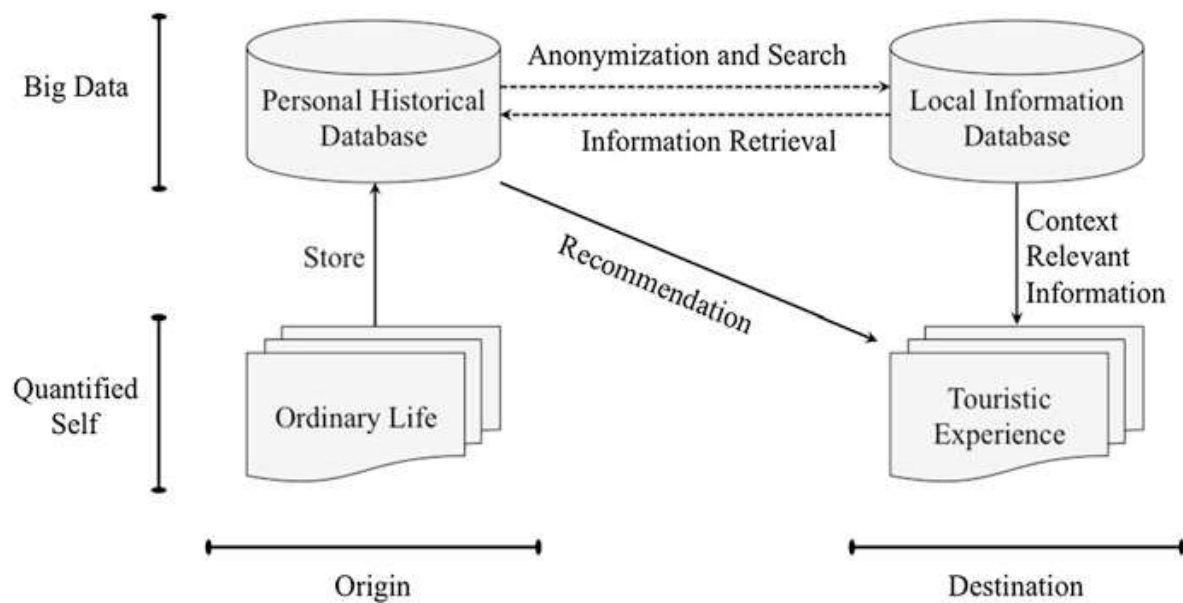


Fig. 4 A basic system integrating the quantified traveler and the touristic experience for SMART tourism destinations

to share their experiences with their family and friends even at the destination (Gretzel, 2010; Tussyadiah & Fesenmaier, 2009; Wang et al., 2012). Among them, information searching and retrieving behaviors are the most vital functions that impact traveler behaviors and experiences (Gretzel, 2010; Wang et al., 2012). Importantly, the use of these technologies affords travelers the ability to create and/or manage their own tourism experiences by not just passively receiving the information from the destination and tourism marketers, but by actively and dynamically engaging in activities within the destination (Zach & Gretzel, 2012). The quantified traveler provides not only contextual information during travel but also personal historical data generated during ordinary life and the connection of that information to the touristic experience (Wang et al., 2014a, Wang, Xiang, & Fesenmaier, 2014b), which can be used for smart tourism development. An example of a system which uses the data created by monitoring these relationships is illustrated in Fig. 4. That is, by exploiting the increased use of wearable devices and sensors, the physical state (e.g., purchase history, movement, and search history) and the emotional state (e.g., mood, feeling, heartbeat) can be tracked unobtrusively and then stored in real time. Further, this data will be expanded as previously existing data is integrated in the system (Andrejevic & Burdon, 2014).

CONCLUSION

This chapter proposes a framework for assessing the potential use of the concept of quantified-self movement (and wearable devices) by integrating individual travelers' previous behaviors and stored sensor data in their ordinary life into system development during travel. This framework consists of components that systematically encode a disparate sources of heterogeneous personal historical data—individual-level big data—collected from the quantified-self devices and interpret those data to be exploited and explored by a recommender system in conjunction with various contextual information (e.g., local information, weather). This framework considers a wide range of applications and their affordances for contributing to, or enhancing, the touristic experience. As shown in Fig. 5, various affordances of emerging systems can be organized on two axes where they support the individual vs. place and where the various measures are monitored on a daily basis or are only trip-related. For example, the nature of data collected for health occurs on a daily basis and on a personal level; this contrasts to hotel or event reservations which are related to places and are trip specific. Further, Fig. 5 illustrates (see the connected lines) that some of the aspects of daily life such as dining preferences, communication with family and friends, etc. can easily extend into the travel experience using emerging mobile technologies. Many other connections (and related affordances) can be mapped using this framework.

The following identifies some possible applications of the quantified traveler concept in smart tourism development.

A Persuasive Recommendation System A recommendation system is the most basic but important benefits from the proposed framework and the developed technologies. This system could integrate not only our travel behaviors and stated preferences within the destination but also our historical data (e.g., emotion, habit) and hidden preferences into the suggestions. For example, this system could

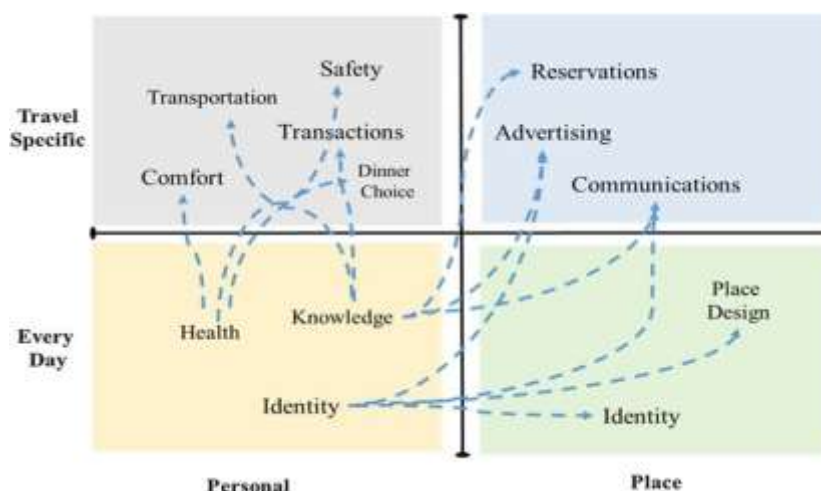


Fig 5 A framework for the quantified traveler

recommend a route for the best jogging route for someone who always run in the morning. In addition, if a traveler walks too much during the trip compared to their original life, this system could suggest him/her to take a little rest at the must-visit restaurant and/or coffee shop depending on their habits.

An Automated and Personalized Hotel Service A wearable device can monitor our body temperature and sleeping habit and then, transfer the information to the sensor installed in a hotel room so that the room environment can be adjusted automatically during the night. Room temperature, light bed, and morning alarm system might be an example for this system.

An Automated Trip Album A device keeps monitoring the entire journey of one's trip to a particular destination. Since the collected data consist of many different types of data format (i.e., photo, video, emotion level, and movement) and are in a huge amount, a device could detect important (and memorable) events based on our saved physical and emotion state automatically as well as manually. This event log will be able to create an automated trip album by an individual traveler and shared with his/her social networks.

A Real-Time Feedback System In order for tourism marketers and destination managers (e.g., theme park, attraction, and hotel operations) to control the quality of their products and services, the devices can keep tracking all the possible situations and provide a continuous but automated feedback to their customers while staying at the hotel and/or enjoying at the tourism attractions. This system could be operated by using a wearable device and/or tag-embedded ticket which can manage waiting time and service failures.

The notion of the quantified traveler provides both opportunities and challenges for the tourism industry. In general, advanced technologies embedded within mobile systems can be used to empower both supply-side (i.e., destinations and tourism businesses) and demand-side (i.e., travelers) to identify, customize, and purchase/produce tourism products (Andrejevic & Burdon, 2014; Sagl et al., 2015; Swan, 2012). Ubiquitous devices and information distributed via these devices can be considered extensions of our five senses, bodies, and minds by repurposing the previously considered role to a more creative facilitator (Kim & Fesenmaier, 2015; Lupton, 2013; Swan, 2012). As such, we can extend or enhance our senses (e.g., voices, gesture, and sight) so as to directly connect to places within the destination or other places and people (e.g., restaurant, shopping, events, and so on). Consequently, travelers are able to access much more diverse information and encounter more possibilities to be creative than ever before, which in turn, enables the traveler to have

even more memorable experiences. In this new ‘extensive’ world, destination and tourism managers can monitor the entire journey from the beginning when a traveler dreams about the destination (and even before actually starting to plan their trip) to the moment that a traveler returns to their daily life and shares their experiences with others.

The way we travel to a destination and the experiences we have at the destination have been constantly evolving because of technology. Now, the advent of the systems supporting the quantified traveler serves as a new generation of tools revolutionizing how people travel. In this new world of the quantified traveler, wearable devices will be used to capture the entire journey (i.e., behavioral outcomes as well as the bodily state) wherein all aspects of the trip can be ‘matched’ perfectly to the individual traveler in a seamless, unobtrusive fashion. Further, it is argued that these new technologies will induce changes in the value creation process wherein travelers become more creative in designing their trip in a way that closely fits their distinctive travel needs, values, preferences, and so on. Of course, these new devices and new ‘informational ecosystems’ threaten traditional information channels that simply provide basic destination related information and/or recommendations. As such, the emergence of the quantified traveler requires the destination to develop more dynamic strategies so as to empower each visitor to choose his/her own unique “activated path” depending on his/her needs. Simple examples of these new services include those described as the ‘sharing economy’ such as Uber or CarShare which are responsive to the immediate needs of the travelers. How to take advantage of these emerging systems, destination managers need to understand better their own products and services within the context of how to design them so as to interact directly with travelers within the destination (Stienmetz & Fesenmaier, 2013, 2015). Several considerations should be emphasized in order for tourism managers to respond to these new innovations. Importantly, gamification, ambient notification, and narrative storytelling should be used to inspire people to adapt those technologies for their own purpose. Additionally, privacy concerns is a very important issue that should be addressed (e.g., Andrejevic & Burdon, 2014) wherein analyses conducted via machine learning are anonymized. Nonetheless, it can be expected that the “big data” generated in travelers’ everyday life and during travel as well as the potential business intelligence created based upon these data can serve as the building blocks for the development of smart tourism destinations. With this said, it is argued that the tourism industry is on the verge of a new revolution which will change not only the tools used to plan travel and the way we create travel experiences, but the nature of the tourism industry itself.

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