The Influence of Technology on Geographic Cognition and Tourism Experience

Iis Tussyadiah
Florian Zach

School of Tourism and Hospitality Management, Temple University, USA
{iist; fzach}@temple.edu

Abstract

Tourists today have access to retrieve voluminous geographic information about destinations while travelling as various context-aware geographic technologies have become increasingly ubiquitous. These technologies are suggested to aid tourists in the process of destination consumption to gain meaningful tourism experiences. This study found that people using different types of technologies for everyday routine perceive that these technologies help them with spatial inference to acquire geographic information; making sense of direction and orientation, and interacting with and within places. Further, within the travel context, geographic technology was found to influence the dimensions of sensory, affective and social experience, as well as the cognitive and bodily experience. The type of technology used for travel was also found to be a significant predictor of the sensory, affective, and social dimensions of tourism experience.

Keywords: geographic cognition; tourism experience; location-aware technology; geographic technology.

1 Introduction

Tourism is largely associated with spatial encounters. Tourists seek benefits from the consumption of the experiential characteristics (i.e., physical, social and cultural) of places, spaces and landscapes. Many studies on the experiential features of geography have emerged (see Tuan 1977, 1993). Most of these set the foundation to understand people's experience with geography and present an endeavour to elucidate the idea of geographical consciousness. Li (2000) argues that, despite the geographic nature of tourism, geographical consciousness has been largely overlooked in tourism research. Based on his phenomenological research, he identifies that travel is joined with other dimensions of living, "which in sum comprises an individual's geographical consciousness" (p. 874), making it an important subject for further exploration.

Today, geographic information is increasingly ubiquitous in various domains. The development of location-aware or context-aware technologies, be it software in personal computers, applications on mobile phones or handheld devices carrying global positioning systems, has opened access for tourists to various venues for retrieving geographic information before, during and after travelling. Research on the use of such technology in tourism has been limited to the areas of technology development (see Brown & Perry, 2001; O'Grady & O'Hare, 2002; Maruyama et al., 2004; Burigat & Chittaro, 2007), arguing that context-aware technology aids to better navigation and programming of tourism, and those using the devices to track tourist's movements (e.g., Shoval & Isaacson, 2007). Despite the argument from the aforementioned studies that geographic technology is developed to assist tourists with ease of movement and richer context-based information, little research has been done

to investigate the influence of geographic technologies on the overall tourists' experience. Modsching et al. (2007) organized a field study to evaluate the impacts of mobile recommender systems on tourists' experience. They uncovered that tourists using such systems were able to see four times more sights in a specific period of time compared to those who did not use the systems. Another field study on tourists' use of maps and guidebooks asserts that technology brings place and space together in activity (Brown and Perry, 2001). These studies, however, did not provide a deeper analysis into how the different types of geographic technologies influence the ways tourists experience the geography of destinations beyond the practical point of view of navigation and way-finding. Needed is a thorough analysis that involves tourists' spatial cognition and behaviour, which cannot be separated from the experience of places in the everyday life. The goal of this study is to explore the influence of the use of geographic technology on the ways people experience the geography of places and their tourism experience. This study serves as a pilot study to identify items appropriate to measure geographic cognition and behaviour.

2 Literature Review

2.1 Tourism Experience

Crouch (2005) argues that tourism is an encounter between and amongst several things: people, space, and contexts. In the early conception of tourism experience, MacCannell (1976) characterizes tourists' sites as locations of the authentic and tourists visit these places in search for the reflection of their authentic selves. This implies tourism as "sightseeing," emphasizing the notion of destinations as a package of visual materials or signs (i.e., authentic attractions). This is akin to the concept of tourist gaze (Urry, 1990, 1995), which gives an emphasis to the 'signs' as the 'objects of gaze' while highlighting the subjectivity of the gaze. Indeed, recent discussion on tourism experience tends to be more subject-centred. Uriely (2005) identifies four developments within the discourse of tourism experience. Among the four are the pluralisation of tourists, depicting the multiplicity of tourist experiences, and the shift from tourism experience as the consumption of displayed objects to the subjective interpretation and meaning. Similarly, Crouch (2005) suggests that being a tourist and encountering spaces "is essentially the process of making meaning of spaces and cultures" (p.28), which "does not equate making clear rationality, but rather working his/her way though things," spaces and relations (p.31).

Using the metaphor of tourism as a form of performance and tourist spaces as stages, Edensor (2001) understands tourism as an array of performative technique and disposition. Consequently, different tourist stages (e.g., mountains, cities, beaches, heritage sites) are often managed to provide and sustain the common sense understanding of a particular performance or activity to take place. Similarly, from a business point of view, Pine and Gilmore (1999) use the theatre–performance metaphor, proposing the importance of staging in the production of experience. Framing these concepts in the context of geography, tourist places, spaces, and landscapes, along with the characteristics embedded in them, are the stages of experiences. Tourists' encounters with these spaces (i.e., resulting in activities, interactions, interpretations), while subjective in nature, are contextualized by the geographic features of the destination with its sensual quality. Here, the geographic

cognition, and the state of geographic knowledge, comes at play as a factor influencing how tourists perform in these stages.

In her attempt to shed some lights on how tourists conceive experience, Volo (2009) asserts the complexity of experience, which is characterised by different dimensions ranging from the intensity of experience, the coupling of sensory and emotional elements, and the variability among tourists. In the area of marketing, Schmitt (2002) introduces five dimensions of experience: sensory, affective, cognitive, physical, and relational. Applying these dimensions into tourism experience, Ye, Tussyadiah and Fesenmaier (2009) identify different elements that make up the structure of experience based on the tourists' interactions with places, people and artefacts. They are the sensory experience, the cognitive and perceptive experience, the social experience, the other bodily experience, and the affective/emotional experience.

Based on the literature, it can, thus, be summarized that tourism experience is a subjective performative action contextualized by the geographical characteristics of tourist destinations, which takes form in different dimensions of sensory, cognition and perception, social, and affective/emotion as a result of interactions between tourists and spaces. In this study, the variables representing the different dimensions of experience are utilized to represent tourism experience.

2.2 Geographic Experience

The discussion of geographic experience is rooted in the fields of cognitive geography, which deals with human perception, memory, reasoning, problem solving, and communication involving earth phenomena (Montello & Freundschuh, 2005), and behavioural geography, which focuses on people's behaviour within space. . Early conceptualizations of geographic cognition are dated back to the work of Lynch (1960) on images of cities, Lowenthal (1961) on environmental images, and Gould (1966) on mental maps, among others. One of the important debates in geographic experience has been on the spatial knowledge that forms people's geographical consciousness, which is the consciousness arising from the spatial and temporal bonds between people and places (Li, 2000). Geographic cognition is intertwined with people's behaviour within space, which can be detected from changes in locations over time. People need to act spatially in a bodily, sensorimotor scale to forage for food, to shop, to commute, etc. (Mark & Freundschuh, 1995). People's movement in space (e.g., commuting, travelling, recreation, and migration) are overt behaviour resulted from a cognitive process of spatial decision making (Lloyd, 1997). Mark et al. (1999) suggest that people extract geographical knowledge from their complex interactions with space. According to Kuipers (1978, 1983), as people move along the paths in the geographic space, they may recognize that the paths have some points in common (i.e., places), which allows them to use inference rules to build network models of places and connections, paths and barriers, in geographic space. Kuipers (1978, 1983) calls this process *spatial knowledge acquisition.*

Golledge (2002) argues that knowledge *of* space (i.e., the declarative base of geographic knowledge) is fundamentally different from knowledge *about* space (i.e., the intellectual base of geographic knowledge). Knowledge about space involves "the recognition and elaboration among geographic primitives" and the advanced concepts derived from these primitives (p. 1). These include geographic arrangement,

organization, distribution, patterns, shape, hierarchy, distance, direction, orientation, regionalization, categorization, reference frame, geographic association, etc.

In summary, geographic experience is intimately associated with geographic knowledge acquisition from people's complex interactions with and within space. It is argued in this study that tourists go through the process of geographic knowledge acquisition and representation as they move to and within the geography of a destination, and use the knowledge to gain a meaningful tourism experience. This study does not exclusively utilize the dimension of way-finding (route knowledge), but includes other dimensions of geographic knowledge use (e.g., hedonic and learning). Several research experiments suggest the dimensions to represent geographic cognition (see Tversky, 1981; Mark et al., 1999), such as distance judgment, sense of direction and orientation (i.e., relations amongst selves, objects, and spaces), judgment of spatial relations (i.e., connections and positions of places relative to others), and effectiveness of communication. These variables are included in this study to represent geographic experience.

2.3 Geographic Technology

Information and communication technology (ICT) has been widely believed to have a substantial geographic impact (Curry, 1998), and geographic technology (i.e., largely based on geographic information systems (GIS), global positioning systems (GPS), etc.) is increasingly available for idiosyncratic use of everyday experiences. The discussion is often coined to the concept of *time–space compression* (introduced by Harvey, 1990) or the precursor to this, the *time–space convergence* (Janelle, 1969), and the term *time–space distanciation* (Giddens, 1981). The salient point in these concepts lies in the understanding that ICT has enabled the process that Giddens (1981, 1984) describes as the expansion of interaction over space and its contraction over time. This is due to the development of GIS as a powerful means to manage voluminous geographic information and recent development in desktop and mobile computing. With the spatiotemporal nature of tourism and travel, tourists and businesses alike found these technologies relevant and important for various tourism-related purposes.

Indeed, tourism has witnessed a vast development of various geographic technologies and platforms of technology applications for tourism purposes, including navigation systems, digital maps, portable guide and/or recommender systems created for general travel use or specific to tourism destinations (see Poslad et al., 2001, Brown & Perry, 2001; O'Grady & O'Hare, 2002; Maruyama et al., 2004; Burigat & Chittaro, 2005). These technologies emphasize the importance of location-based services for the ease of information search for travel decision making process. For example, Brown and Chalmer (2003) argue that mobile technology, with context-aware application, is useful to assist tourists in solving their problems, of which are idiosyncratic and largely related to navigation and way-finding. These travel decision making processes typically involve information search (including geographic information), processing, and use, which are akin to the aforementioned process in geographic cognition. These processes have been taken for granted in tourism research; lacking is a thorough analysis to conceptualize technology influences on patterns of behaviour. Therefore, this study aims at providing a better understanding on the influences geographic

technology has on people's geographic behaviour in terms of geographic knowledge acquisition and use. Further, this study also analyzes how technology influences the different dimensions of and the overall tourism experiences.

2.4 Research Propositions and Goals of the Study

Based on the literature, this study examines the following propositions:

Proposition 1: The use of geographic technology aids to geographic cognition and behaviour in a day-to-day routine and influences tourism experiences.

Proposition 2: The use of geographic technologies for travel, the purpose of use as well as the time of use influence tourism experiences.

This pilot study is a first attempt to develop a unified set of items to measure the use of geographic technologies and its influence on travellers. As such, the goal of the study is fourfold: 1) to identify the use of the different types of geographic technologies and the purposes of use of such technologies; 2) to better understand how geographic cognition and behaviour due to the use of geographic technology affect tourism experiences; 3) to better understand how the use of geographic technologies for travel affect tourism experiences; and, 4) to develop a set of items that best captures the aforementioned aspects of use of geographic technologies.

3 Methodology

Past studies on tourism and geographic experiences are typically qualitative in nature as they are based on experiment and observation. However, the increased interest in geographic technologies and their effectiveness in creating meaningful tourism experiences suggest that a standardized set of constructs and items is necessary to further develop this field of research. The development of these scales followed the procedures suggested by DeVellis (1991). Extensive evaluation of existing literature led to the development of eleven theory driven items to measure geographic cognition and geographic behaviour due to the everyday use of geographic technologies (i.e., distance judgment, sense of direction and orientation, judgment of spatial relations, and effectiveness of communication). Furthermore, twelve items to measure sensory, bodily, cognitive, perceptive and affective tourism experiences when travelling were developed. Where possible pre-existing constructs were used or adapted to fit the purpose of this study (Straub, 1989). These items were reviewed by two experts in the field to assess face validity. The reviewers suggested minor changes which were incorporated to finalize the items to be measured on 7-point Likert scales with Strongly Disagree/Strongly Agree anchor statements.

An online survey was administered for data collection. The survey questions consist of geographic technology use for day-to-day routine and leisure or business travel. These include patterns of use, devices used and purposes of use as well as the eleven geographic cognition and behaviour items. For their most recent travel within the past two years, respondents were also asked to identify the types, purposes and times of geographic technology use and to rate the influence of these technologies on their tourism experience. Lastly, several demographic control variables were collected. An invitation to participate in the study was initially sent on mid August 2010 to 2,814

Americans randomly selected from a tourism email list. All recipients requested travel information about the US Midwestern states over the past 3 years. An incentive to win a $50 or one of two $25 gift cards was provided. Given our interest in travellers only those that indicated a travel of at least 50 miles away from home within the past two years (filter question at the beginning) were allowed to complete the survey. Following three reminders, 104 complete responses were collected (3.7% response rate). One reason for the low response rate could be that several addresses were added as early as three years ago and that several addresses could have been abandoned. The distribution system used for this study could not track bounce-back addresses.

4 Result and Discussion

Respondents were provided an example list of different types of geographic technologies such as car navigation system, geo/location-based applications on smart phones, geographic applications on computers, portable digital guides at museums/attractions and portable GPS devises for hiking. It was found that respondents used geographic technologies quite frequently both in everyday use and for travel for work or leisure. While the use of geographic technologies in daily routines is lower, with 16.3% of respondents indicating rarely and 3.8% indicating never, it was found that essentially every traveller did use geographic technologies, whereby one fifth of respondents always uses geographic technologies when travelling. As for the reasons why respondents use geographic technologies, Navigation and Wayfinding was the most often cited reason (87.1%). Additional reasons such as Fun and Curiosity, Itinerary Planning and Confirmation and Learning about Places were mentioned only by about one third of respondents (37.5%, 34.6%, 32.7% respectively), while another 8.0% provided Other Reasons such as geocaching or retrieving weather information.

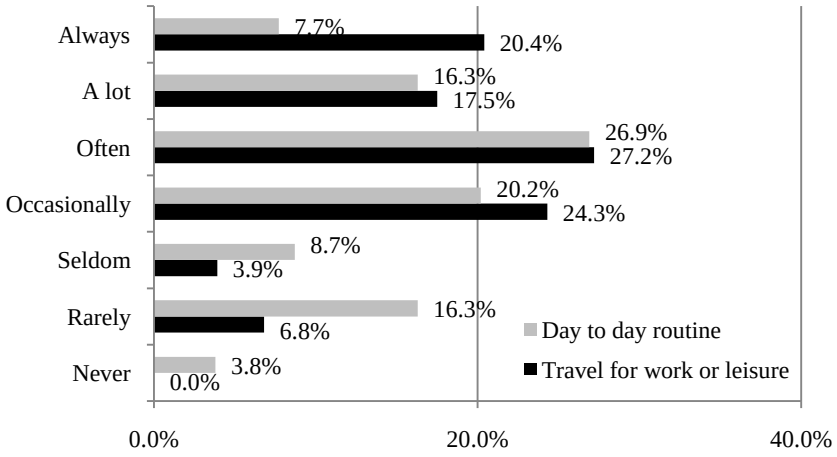

Figure 1. Frequency of Use of Geographic Technologies

Table 1 shows a crosstab of the purposes of use and the different types of geographic technologies as well as the time of use for respondents' most recent travel within the past two years. While Navigation and Wayfinding was cited the most often when car

navigation systems were used, Fun and Curiosity dominated all other types of technologies. As for the purpose of use at different stages of travel, it was found that Navigation and Wayfinding was strongly represented, particularly when travellers are on the way to the destination. At the destination, Learning about Places was only ranked second after Fun and Curiosity. The latter was also the most often mentioned reason to use geographic technology once the travellers left the destination.

Table 1. Purpose of Use by Type of Geographic Technology and Time of Use for the Most Recent Travel in the Past Two Years

N=104	Purpose of Use			
Type of Technology	**Navigation and Wayfinding**	**Itinerary Planning**	**Learning about Places**	**Fun and Curiosity**
Car Navigation Systems	**81.8%**	18.2%	0.0%	0.0%
Geo-Based Applications on Smart Phones	33.3%	0.0%	0.0%	**66.7%**
Geographic Applications on Computers	**32.6%**	11.6%	20.9%	**34.9%**
Portable GPS Devices for Hiking etc.	21.7%	7.9%	15.8%	**45.5%**
Portable Digital Guides at Museums and/or Attractions	5.6%	5.6%	11.1%	**77.8%**
Time of Use				
Before Travel	**36.8%**	15.8%	21.1%	26.3%
On the Way to the Destination	**66.7%**	13.3%	6.7%	13.3%
On-site, in the Destination	**30.0%**	5.0%	**30.0%**	**35.0%**
On the way Back from the Destination	**26.9%**	7.7%	15.4%	**50.0%**
After Travel	5.0%	8.0%	5.0%	**90.0%**

Exploratory factor analysis on each of the two dimensions of the technology influences was conducted to identify the underlying constructs (See Tables 2 and 3). Internal consistency of the identified constructs was evaluated using Cronbach's Alpha. All alpha coefficients were 0.8 or higher and thus exceed the value 0.6 as suggested for exploratory factor analysis (Hair et al., 1998). Furthermore, all factor loadings were above 0.5 with a substantial amount of variance explained by the items for each of the identified constructs.

As for the proposed dimensions themselves, three constructs for geographic cognition and behaviour and two constructs for tourism experience were identified. While these constructs have not been developed ex-ante they do fit within the framework of this study. A challenge for this study was that past research applied the same labels for quite different aspects of geographic and tourism experiences without exploring more subtle differences. However, it is argued that awareness of geographic positions and relations as well as borders and geographic boundaries refers to the process of Spatial Inference for knowledge acquisition, whereas awareness of movement and position reflects respondents' awareness of their positions and judgment of direction (labelled Direction & Orientation) (Mark et al., 1999) (See Table 2). Similarly, tourism experiences are reflected in their dimensions. In retrospect to Schmitt's (1999)

dimensions of experience, the first construct consists of the dimensions of sensory, emotion and association, whereas the second construct represents the dimension of learning and action (See Table 3).

Table 2. Internal Consistency and Unidimensionality for Geographic Cognition and Behaviour

Scale Item	Internal Consistency	Unidimensionality	
		Factor Loading	Variance Explained
Spatial Inference	0.904		
When using geographic technologies I am ...			
COGBEH01- ...able to distinguish different places based on their characteristics.		.849	82.9%
COGBEH02- ...able to recognize from my surrounding that I enter a new area.		.822	78.4%
COGBEH03- ...aware of geographic borders, areas, and territories.		.819	76.7%
COGBEH04- ...conscious about the place where I belong to.		.773	70.4%
COGBEH05- ...able to recognize signs, landmarks and other physical cues that give me the sense of where I am.		.609	63.2%
Direction & Orientation	0.853		
When using geographic technologies I am ...			
COGBEH06- ...aware of my position in space.		.925	90.4%
COGBEH07- ...aware of my movement through space.		.894	89.0%
COGBEH08- ...conscious about how far I am from home.		.547	60.8%
Interaction	0.806		
When using geographic technologies I ...			
COGBEH09- ...better understand the unique relationships between a place and its people.		.891	85.2%
COGBEH10- ...interact more with people.		.810	69.3%
COGBEH11- ...pay more attention to places.		.749	61.7%

To capture the interrelationship between Sensory Emotion & Association and Action & Learning, MANOVA was computed. The independent variables were Spatial Inference, Direction & Orientation, and Interaction as well as categorical variables that captured the type of geographic technology used, the purpose and the time of use during the most recent travel. The analysis indicated a significant main effect for the type of geographic technology used for travel, Roy's Largest Root=.275, $F(4, 53)=3.646$, $p<.011$. From the univariate analysis, a significant effect of type of technology on Sensory Emotion & Association was found, $F(4, 53)=3.490$, $p<0.013$.

No other main effect was found to be significant. The analysis also revealed a significant effect of the interaction between the type of geographic technology, time and purpose of use, Roy's Largest Root=1.083, $F(31, 53)=1.852$, $p<.024$.

Table 3. Internal Consistency and Unidimensionality for Tourism Experience for the Most Recent Travel in the Past Two Years

Scale Item	Internal Consistency	Unidimensionality	
		Factor Loading	Variance Explained
Sensory Emotion & Association	0.950		
When using geographic technologies I am ...			
EXPERIENCE01- ...able to reflect on my memories at the destination.		.869	79.9%
EXPERIENCE02- ...able to associate certain sights, smells, sounds, tastes, and textures with the destination.		.837	81.1%
EXPERIENCE03- ...able to recognize the differences of the destination from home.		.826	77.3%
EXPERIENCE04- ...able to interact with others at the destination.		.818	73.3%
EXPERIENCE05- ...able to associate certain behavior with the destination.		.807	76.5%
EXPERIENCE06- ...able to develop a certain emotional connection with the destination.		.783	77.7%
EXPERIENCE07- ...able to relate the destination to specific concepts and/or lifestyle.		.724	74.4%
EXPERIENCE08- ...able to develop like and/or dislike toward the destination.		.651	58.1%
Action & Learning	0.875		
When using geographic technologies I am ...			
EXPERIENCE09- ...aware of the different activities I could partake in the destination.		.848	79.9%
EXPERIENCE10- ...able to recognize important sights and attractions at the destination.		.814	73.6%
EXPERIENCE11- ...able to develop knowledge about the destination.		.797	71.1%
EXPERIENCE12- ...able to develop a better understanding about the destination.		.675	72.7%

The Association, $F(31, 53)=1.797$, $p<0.030$. No other interaction was found to be significant. The parameter estimates indicate that the significant effects are driven by On-site/At the Destination, Navigation/Wayfinding, and Car Navigation Systems, as well as On-site/At the Destination, Navigation/Wayfinding and Geographic Applications on Computers with B=-2.799, t=-2.192, p=.03 and B=-3.691, t=-2.085, p=.042, respectively.

5 Conclusion and Implication

This study seeks to identify the influences of different types of geographic technologies on people's experience in everyday routine and while travelling. Based on a preliminary analysis using exploratory factor analysis, it is found that geographic technology influences the everyday experience in three dimensions: the process of spatial inference to acquire geographic knowledge (i.e., geographic cognition), the process of making sense of direction and orientation (i.e., spatial relations), and interactions with and within spaces (i.e., the use of geographic technology to interact with people and space and to understand the unique relationships between a place and its people). Similarly, within the context of travel, it was found that geographic technology influences tourism experience in two distinct dimensions: 1) the sensory, affective and social experience (i.e., the ability to sense, feel and associate destinations with specific concepts) and 2) the cognitive and bodily experience (i.e., the ability to learn about and partake in activities at the destination).

While this pilot study identified significant constructs to measure the dimensions of geographic and tourism experiences affected by technologies, the interrelationships between these two were not found to be significant. This can be due to the small sample size and the unequal group memberships in the three-dimensional type, time and purpose of use matrix at the first stage of this study. The type of technology used and the interactions between the type of technology, the time of use, and the purpose of use were found to be significant predictors of the sensory, affective and social experience. This signifies that, depending on the devices tourists use before, during and after travel, they were able to better enjoy, develop emotional connection to, and relate with the destination. It was also found that the significant effects are driven by the use of car navigation systems for navigation on site as well as the use of geographic applications on computers for navigation on site. This indicates that technology used to aid tourists with gaining route knowledge contribute to the ways tourists enjoy and connect with the destination. The findings of this pilot study suggest that ICT providers and tourism destinations need to provide information that and features that nurture sensory, affective and social as well as cognitive and bodily experiences to enhance travel experiences to the destinations. In particular it appears that information provided needs to be different throughout the travel. Geographic technologies used before the trip need to incorporate essentially all aspects of travel planning, whereas technologies used on the way are used as guides for navigation. When at the destination it appears that users receive the most benefits for their experience when geographic technologies provide information on navigation, learning as well as fun and curiosity. This suggests that destination marketing organizations need to collaborate with providers of geographic technologies to provide this information. Last, geographic technologies used on the way back and at home are used mostly to re-evaluate the trip and to augment the travel experience.

The follow-up study, thus, needs to achieve a higher response rate with about similar group sizes. Furthermore, some of the items used in this study need to be re-evaluated and adapted to better capture the underlying constructs. Lastly, future research needs to evaluate the effect of the use of the same geographic technology for everyday use and for travel. An within subject analysis is needed to identify if familiarity with certain technologies positively affects the geographic cognition when travelling.

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