Journal of Vacation Marketing

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Journal of Vacation Marketing 2009; 15; 149
DOI: 10.1177/1356766708100904

The online version of this article can be found at:
http://jvm.sagepub.com/cgi/content/abstract/15/2/149

Published by:
SAGE
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Mobile-mediated virtual experience in tourism: concept, typology and applications

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Received (in revised form): July 2008
Anonymously refereed paper

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Abstract

The main purpose of this paper is to conceptualize virtual tourism in the mobile context. Through the concept of telepresence, the typology of virtual experience can be explained by two dimensions: vividness and interactivity. The authors first discuss virtual experience in terms of several categories ranging from verbal-based to animated interactive experience. Based on these categories, various mobile applications are then identified to complete the typology. Finally, practical discussions are provided with examples to illustrate various mobile services that facilitate virtual experiences and the application of the mobile-mediated virtual experience to tourism with consideration of the destination marketing organization's innovativeness and consumers' needs for mobile usage.

KEYWORDS: virtual experience, mobile-mediated VE applications, mobile technologies, virtual tourism, mobile destination marketing

INTRODUCTION

The tourism product is a holiday experience substantially different from other products as facilitated by numerous suppliers (Gnoth, 2002). Travel is increasingly more about experiences, fulfilment and rejuvenation than about places and things (King, 2002) and the tourism product is generally perceived as experientially-demanding (Bei et al., 2004; Dolnicar, 2005). Experiential product attributes can be accessed only through the limited use of the product (Kempf and Smith, 1998). Products dominated by experiential attributes are referred to as experience products and are best evaluated by consumers through first-hand experience (Smith and Swinyard, 1982). Such requirement makes it difficult for one to 'pre-immerse a trial' because one can personally experience a destination only after

Journal of Vacation Marketing
Vol. 15 No. 2, 2009, pp. 149–164

Los Angeles, London, New Delhi, Singapore and Washington DC
www.sagepublications.com
DOI: 10.1177/1356766708100904

embarking the trip and arriving at the destination. To reduce the perceived risks and difficulties, travelers use various information sources, such as TV, brochures, newspapers, word-of-mouth, and previous vacation experiences. Among these traditional information channels, word-of-mouth and previous vacation experiences are widely accepted as the most reliable and influential information for describing a destination because they are acquired from the direct experience (Gartner, 1993). This implies that travelers seek information that vividly describes a destination (Nelson et al., 2006) and are highly interactive to virtually experience the destination. This sub-optimal reality is at least close to a direct experience before the trip actually takes place.

Virtual experience can be used to approximate such vividness and interactivity through a real-time contact with a destination by technological applications such as three-dimensional (3D) technology, thereby immersing travelers in the destination. Also, virtual experience can be used to encourage travelers to reminisce memories after a trip, for example, by providing richly informed videos recorded at the destination. While both the traditional web presence and mobile technologies can be utilized to achieve rich and vivid experience for travelers through virtual experience, mobile technologies (e.g., using mobile phones) are superior to the wired technologies (e.g., using laptop computers) because of the better mobility. With the launch of 3G standard such as HSDPA (High-Speed Downlink Packet Access), travelers are now able to download sizable video streaming to their mobile devices as fast as do laptop computers. Furthermore, video telephony service makes it possible for individual tourists to conduct face-to-face communications and share visiting experiences instantaneously at a destination.

To take advantage of mobile technologies for enhanced travel experiences, it is required to understand and conceptualize mobile-supported virtual experience in a tourism context; in this paper it is referred to as 'V-Tourism.' Hence, this paper focuses on developing the concept of V-Tourism along with its supportive mobile applications to provide a foundation for expanding the knowledge in this newly recognized area. This effort also facilitates important discussions about how destination marketing organizations (DMOs) can strategize tourism-related services to market mobile travelers. In this paper, the authors attempt to answer vital research questions as follows:

- What is virtual experience and what types of virtual experience exist?
- How can current mobile technologies support the virtual tourism experience by suggesting research propositions?
- How can DMOs use this new form of tourism medium to meet the modern mobile travelers' needs for marketing the destination?

DEFINING VIRTUAL EXPERIENCE (VE)

A virtual experience (VE) needs to be precisely defined because it is sometimes blurred by the meaning of 'virtual reality (VR).' The distinctive conceptualization is necessary to provide a sound classification of various types of virtual experience. Steuer (1992) defined virtual experience from a human experience perspective rather than technological hardware while virtual reality refers to a simulation or representation of a particular environment using media (Cho, 2002) or is defined as a mediated environment in which a perceiver experiences telepresence (Li et al., 2002).

Accordingly, Cho et al. (2002) defined virtual experience as 'the experience in the virtual environment using a computer-mediated environment and is based upon the concept of telepresence' or 'the extent to which consumers feel their existence in the virtual space' (Shih, 1998). Meanwhile, telepresence and virtual experience are interchangeably used as Steuer (1992) defined telepresence as 'the experience of presence in an environment by means of a communication medium' or 'an illusion of 'being there' in a mediated environment' (Kim and Biocca, 1997). Similarly, Floridi (2005) argued that 'presence is often understood as a type of experience of being there, one loosely involving some technological mediation and often depending on virtual environments.'

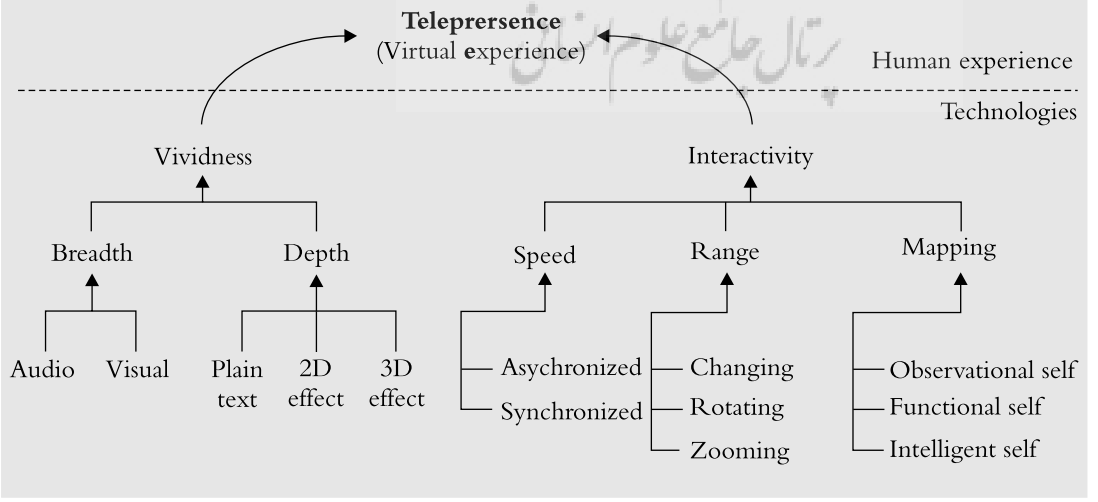
Virtual experience can be created by the use of 3D product visualization through the new media (e.g., mobile devices) even if it is considered to be similar to indirect experience (Heeter, 2000). However, VE has much closer nature to direct experience than indirect experience with regard to interactivity. Thus, VE possesses characteristics of both direct and indirect experiences for consumer learning (Li et al., 2001). In other words, direct and indirect experiences can be simulated with VE as a form of mobile-based 3D or 2D formats. For example, Fiore et al. (2005) contend that both direct and indirect experiences can be realized by using interactive 3D-based technologies which allows consumers to rotate, and zoom-in and out the product. Indirect information obtaining from text-based and 2D plain photos can also be enriched by increasing vividness (e.g., changing color). Experiential information from direct experiences may be persuasively imitated by virtual world (e.g., Second Life), which enables consumers to walk on the street and talk to neighbors in a simulated environment. VE is even advantageous over direct experience when attributes of animated products capture consumers' involuntary attention and frame a different perception of the product. As Fasolo et al. (2006) note, the products that are animatedly presented with interactivity on the web improve consumers' choice intention because interactivity increases their tangibility (Koernig, 2003).

COMPONENTS OF VIRTUAL EXPERIENCE

Telepresence as a human virtual experience is rendered by vivid and interactive technologies. To understand the concept of telepresence, it is helpful to discuss a virtual experience typology (shown in Figure 1) that is defined by two dimensions: vividness and interactivity (Steuer, 1992). This expanded typology delineates more detailed sub-categories than those proposed by Steuer (1992) in order to accommodate a more distinctive and complete coverage. For example, the authors include 'mapping' as a way of interacting for telepresence. It reflects how much control the concept of 'self' can exercise in an interactive environment. This expansion allows a more complete and better understanding of a human virtual experience. Vividness is defined as 'the intensity with which a mediated environment is able to present information to the senses' (Li et al., 2002). Vividness can be explained by sensory breadth and depth.

'Sensory breadth' commonly refers to the number of communication channels. In particular, it means the number of sensory dimensions simultaneously presented by a

Expanded typology of virtual experience (Adapted from Steuer, 1992) *Figure 1*



communication medium such as auditory, touch, taste-smell and visual (Klein, 2003). For example, television addresses both the audio and visual systems whereas radio addresses only the audio system, thus, TV has greater sensory breath. As a result of experiencing multi-sensory systems, vividness can be increased. However, modern technologies are still working on realizing accurate touch, taste, and smell senses.

'Sensory depth' is defined as 'the resolution within each of the perceptual channels' and commonly refers to the quality within each channel or quality of information (Steuer, 1992). For example, better sound quality of music is desired when one has to select between a Compact Disc than radio broadcasting. If a greater quantity of data is encoded to represent a far wider auditory bandwidth that can replicate diverse musical instruments and various voices, then much greater depth can be provided to satisfy sensory enjoyment.

Steuer (1992) further defined interactivity as 'the extent to which users can participate in modifying the form and content of a mediated environment in real time.' This definition was elaborated by Li et al. (2002) as 'a form of user control to select the timing, content, and sequence of a communication act within a mediated environment which.' Interactivity can be examined by three components: speed, range, and mapping.

'Speed' refers to the rate at which input can be assimilated into the mediated environment (Steuer, 1992). Real-time interaction is the most valuable representation as it provides the fastest speed of interaction, the shortest response time, or the immediacy of response. While some media such as conventional films or books are not interactive at all, the mobile communications such as chatting or phoning is undertaken in real-time interaction. Time-critical needs (e.g., immediacy and urgent information) can be fully supported at any time by mobile devices. On the other hand, web users can respond to chatting or emailing. Therefore, mobile devices can be considered more synchronized than many other media.

'Range' refers to the number of possibilities for action at any given time (Steuer, 1992). This terminology is related to the amount of change affected by the mediated environment. For example, conventional television has limited range of choices to turn the programs on or off and volume up or down. This leads one to perceive one's experience as more mediated by the TV. In contrast, the mobile devices such as the recently launched iPhones enable the consumers to control more in direct experience, such as flipping, rotating, and zooming-in and out photos or videos. This allows the consumer to perceive the environment as less mediated and give more controls to the consumer (Klein, 2003).

'Mapping' refers to the ability of a system to map its controls to changes in the mediated environment in a natural and predictable manner (Steuer, 1992). Successful mapping relies on how the mediated action can imitate as closely as human's. For example, just watching the hotel room at 3D environment (observational self), turning a steering wheel on an arcade video game that makes the virtual car on the screen move accordingly (functional self), and opening the window in a hotel room, saying 'hello' to a room attendant and receiving his response of 'how are you, Sir' (intelligent self).

MOBILE-BASED VE TYPOLOGY AND MOBILE APPLICATIONS

Modality refers to the mode of information presentation (i.e., text, audio, picture or video) that correspond to human senses used for interpreting the given material (Dijkstra et al., 2005). As virtual experience increases based on the degree to which people are exposed to components of vividness and interactivity, multi-modal system (e.g., TV) can evoke more effective communication than unimodal system (e.g., only text-based information) (Jacoby et al., 1983). As seen in Figure 2, the current study selected 15 mobile applications from those suggested by Hyun et al. (2007b). These mobile applications are mapped to represent VE typology based on the level of vividness and interactivity.

As shown in Table 1, application is weighted depending on the level of vividness. Auditory and visual senses are worth of 1 point each. Since depth ranges from simple text (lowest

Table 1: Classification of mobile applications

	Vividness						*Interactivity*								
	Breath		*Depth*				*Speed*		*Range*				*Mapping*		
Mobile applications	*Audio (1)*	*Visual (1)*	*Plain text (1)*	*2D effect (3)*	*3D effect (5)*	*Total*	*Asynchr-onized (1)*	*Synchr-onized (2)*	*Changing (1)*	*Rotating (1)*	*Zooming (1)*	*Observational self (1)*	*Functional self (3)*	*Intelligent Self (5)*	*Total*
Short Message Service (SMS)			✓			1	✓								1
Mobile Voice Message	✓					1	✓								1
Mobile Text Chatting			✓			1		✓							2
Voice Telephony	✓					1		✓							2
Multimedia Message Service (MMS)		✓	✓	✓		5	✓					✓			2
Mobile Photo Message		✓		✓		4	✓					✓			2
Mobile Video Message	✓	✓			✓	7	✓					✓			2
Mobile Photo Album		✓	✓	✓		5	✓			✓	✓	✓			4
Mobile Video Album	✓	✓			✓	7	✓			✓	✓	✓			4
Mobile TV	✓	✓			✓	7	✓					✓			2
LBS Navigation Service		✓	✓		✓	7		✓			✓	✓			4
Video Telephony	✓	✓			✓	7		✓		✓	✓	✓			5
Virtual Tour	✓	✓			✓	7	✓			✓	✓	✓	✓		6
3D Games	✓	✓			✓	7	✓		✓	✓	✓	✓	✓		8
Second Life	✓	✓			✓	7		✓	✓	✓	✓	✓	✓	✓	14

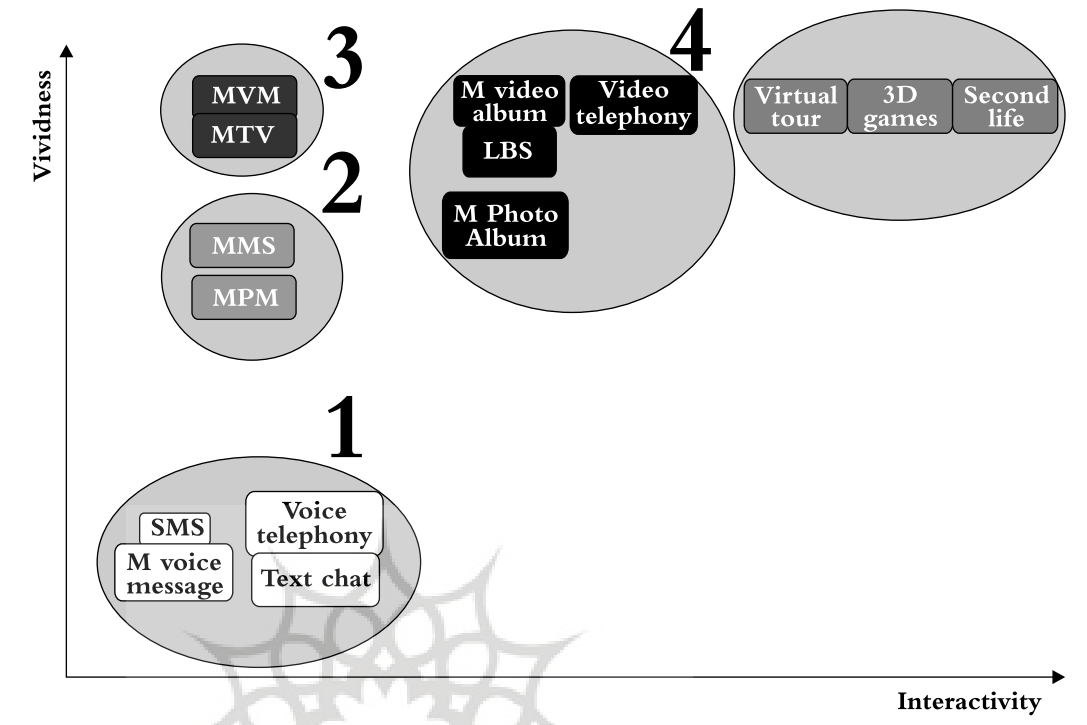
vividness), still photos (medium vividness) to 3D graphics (highest vividness), text-containing mobile applications are weighted with 1 point; 2D photo effect with 2 points; and 3D-effect graphics or video with 3 points. Regarding interactivity, speed is classified into asynchronized (low speed of real-time interaction) and synchronized (high speed). Asynchronized speed is weighted with 1 point, whereas synchronized speed is with 2 points. Range is divided into 'changing,' 'rotating' and 'zooming' which are all weighted with the same score (1 point). Mapping has three different levels; observation self (low interactivity), functional self (medium interactivity) and intelligent self (high interactivity) with 1, 2, and 3 points, respectively. In this classification scheme based on vividness and interactivity, existing mobile applications are conceptually positioned according to the total of weighted scores. For example, virtual tour in Category 5 is considered to be more interactive and richer than Short Message Service (SMS) in Category 1.

According to the score, mobile applications are mapped as Figure 2 and Virtual Experience (VE)[1] is classified into five categories, depending on the form of product presentation: **1** = verbal-based VE; **2** = pictorial-based VE; **3** = non-interactive 3D VE; **4** = interactive-based 2D/3D VE; and **5** = animated-based VE. Each category is further explained below.

Verbal-based VE

Verbal-based VE is defined as experience formed by written or spoken signals in a mediated environment. Vividness of verbal-based VE is the lowest because it only stimulates one sensory such as auditory or reading a text. However, the level of interactivity varies, depending on synchronized speed. For example, text messages unilaterally are received or sent

Figure 2 Typology of mobile-mediated virtual experience



through SMS, whereas mobile text chatting can be done bilaterally at a real-time basis (see Figure 3). Mobile voice messages are asynchronized communication, whereas voice telephony is used for two-way communication at a high level of interaction. Therefore, a proposition is suggested.

Proposition 1: Verbal-based mobile applications have low interactivity and low vividness, thereby producing the lowest level of telepresence.

Still pictorial-based VE

Still pictorial-based VE can be described as experience formed by still 2D-based photos or pictures sent or received by mobile phones. Vividness of this type of VE is higher than verbal-based VE. For example, Mobile Photo Message (MPM) and Multimedia Message Service (MMS) include graphics, text, and sound. However, this message is just sent or received without real-time communication. However, interactivity may be lower than some verbal-based VE (e.g., mobile text chatting mentioned earlier). Therefore, a proposition is suggested.

Proposition 2: Still pictorial-based mobile applications have a low interactivity and a high vividness, thereby producing a low level of telepresence.

Non-interactive 3D-based VE

Non-interactive 3D-based VE is experience formed by watching 3D-based video streaming. Vividness is higher than previous two types of VE because video streaming provides sound and 3D movement. However interactivity is still asynchronized. For instance, Mobile Video Messages (MVM) and Mobile TV (M TV) can provide highly rich multimedia experience (high vividness). Mobile users can only play these multimedia but not manipulate video clips on the mobile phones (low interactivity). Therefore, a proposition is suggested.

Proposition 3: Non-interactive 3D-based mobile applications have a low interactivity and the highest vividness, thereby producing a medium level of telepresence.

Interactive 2D/3D-based VE

Interactive 2D/3D-based VE is experience formed by uploading and downloading 2D photos or 3D videos, or streaming videos through mobile phones at a real-time basis. Examples are video telephony, MCC (Mobile Created Content), and LBS (Location-Based Service) map service. Video telephony and videoconferencing enable mobile users to conduct face-to-face communications with each other. MCC results from the interactions among mobile users who create and share video and/or photo contents. For example, CNN (Cable News Network) iReport allows users to interact directly with the TV station by providing stories, pictures, and videos through the mobile device (see Figure 4). LBS map service utilizes the GPS (Global Positioning System) service to help mobile users navigate directions in a city map (see Figure 5). Therefore, a proposition is suggested.

Proposition 4: Interactive 2D/3D-based mobile applications have a high interactivity and the highest vividness, thereby producing a high level of telepresence.

Animated-based VE

Animated-Based VE is an immersive experience formed by directly interacting with an animated 3D virtual world. Vividness is lower

A snapshot of iReport *Figure 3*

Mobile text chatting *Figure 4*

Figure 5 Mobile location-based map service

than interactive 2D/3D-based VE because animated 3D environment is artificially created rather than real-life 3D environment. However, interactivity of this VE is higher than any other VEs. In addition, animated-based VE approximates human beings' behaviors more than any other VEs do. Three types of animated VE can be classified as observational self (e.g., virtual tour), functional self (e.g., 3D games) and intelligence self (e.g., online simulation games such as the Supple game and Second Life).

Figure 6 shows a swimming pool in a resort hotel as an example of observational self which can be depicted as experiencing 3D life only by watching an object. 3D environment is presented by 360° rotating, and zooming in and out. Mobile 3D games can be classified as functional self which can be described as experiencing 3D life by imitating only limited human's movement. For example, the mobile 3D golf game provides walking and hitting only (see Figure 7).

However, the 3D mobile game, 'Supple,' is different from the golf game (see Figure 8). Supple, powered by the artificial intelligence technology, is about building relationships, shopping, making money and getting ahead at work. In Supple, characters really speak and are engaged in actual dialogs. They are 'intelligent selves,' which can be described as 'living in 3D digital life world as animated agents.' These animated characters imitate human-like behaviors such as walking, touching, and speaking to one another. As shown in Figure 9, the Second Life is another 3D virtual world entirely built and owned by its residents. Since opening to the public in 2003, it has grown explosively and today is inhabited by almost ten million 'online' residents from around the globe (*Linden Research*, 2007). Therefore, a proposition is suggested.

Proposition 5: Animated-based mobile applications have the highest interactivity and the highest vividness, thereby producing the highest level of telepresence

Virtual tour in front of a resort swimming pool *Figure 6*

Mobile 3D golf game *Figure 7*

Animated 3D-based mobile supple game *Figure 8*

Animated 3D-based second life *Figure 9*

V-TOURISM AND DESTINATION MARKETING ORGANIZATIONS

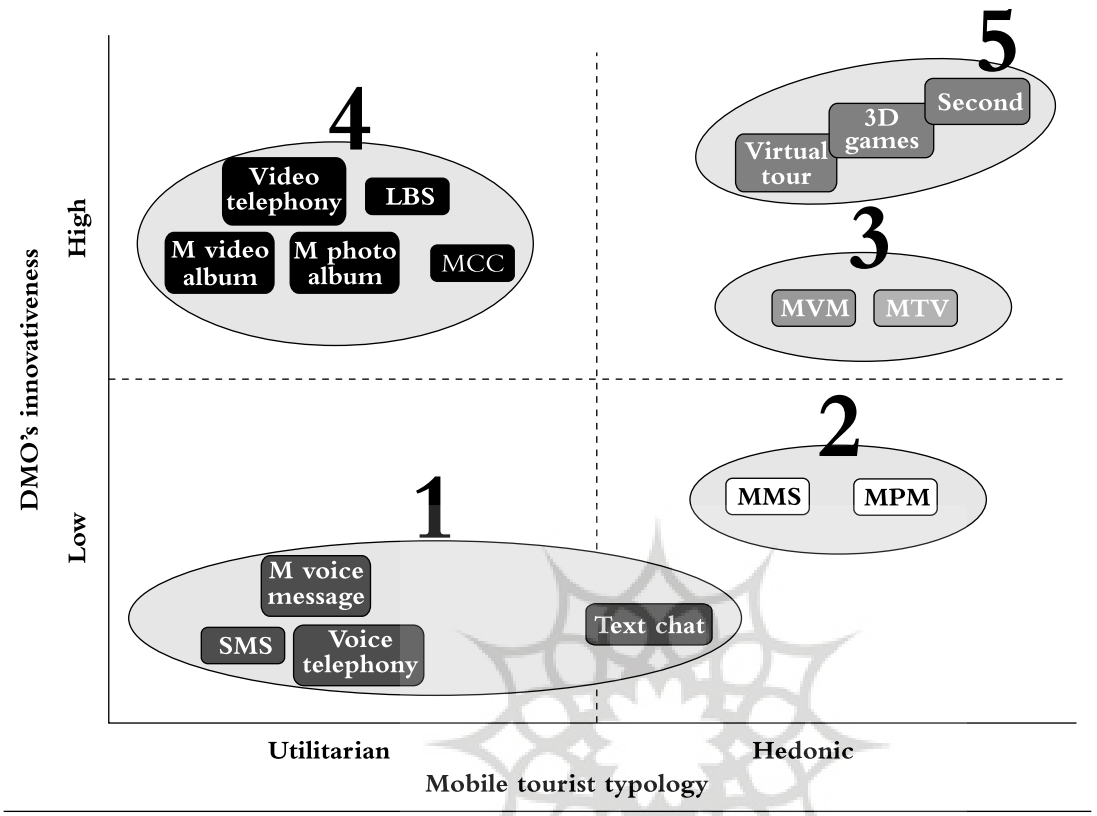
Destination marketing organizations (DMOs, such as National/Regional/State Tourism Organizations) are mainly responsible for boosting the local economy through destination promotion, tourism product development, cooperation with local businesses, and destination visitor satisfaction (Seaton and Bennett, 1996). To achieve such goals, it is inevitable to adopt various information technologies (ITs) which will result in cost reduction and efficient marketing operations. In particular, considering the emerging markets such as increased individual tours and the growing IT-savvy consumer markets (e.g., mobile consumer and Generation Y markets), DMOs should make a conscious effort to gain competencies in adopting and understanding the mobile platform for tourism purpose (Hyun et al., 2007a). However, DMOs seem to lag behind the advanced Its (Ndou and Petti, 2007) such as mobile technologies that will be likely to create tremendous value for destinations by various mobile means to enhance marketing communications and travel experiences. This lack of investment in preparing for mobile or virtual tourism may be due to either situational or fundamental factors such as short of internal resources for innovation (e.g., adequate finance and/or highly-skilled employees), limited supportive roles constrained by other budgetary prioritizations, or simply immature IT infrastructure for advanced mobile applications (Siguaw et al., 2006).

In anticipation of fast-growing mobile development in the near future, DMOs need to envision how to maximize their current innovative competencies in adopting mobile technologies for destination marketing purposes. Since DMOs' innovative levels vary, different strategies for implementing mobile services should be taken into consideration. To facilitate a constructive discussion, aforementioned mobile technologies are presented in Figure 10 where DMOs' innovativeness is classified at the low or high level while mobile tourist typology is classified as either utilitarian or hedonic in this study. Given the perceived innovativeness of a DMO, this figure provides the DMO's professionals with general suggestions to consider various mobile technologies for compatible mobile tourist markets.

The mobile tourist typology based on benefit sought is practical and useful because the marketing communication effectiveness varies depending on the tourist's motivation for benefit. Such motivation often is related to the tourist's needs for travel information. When travelers go through their decision-making processes, they need two types of information to make the best travel choice: goal-directed and experiential information (Sánchez-Franco and Roldán, 2005). Goal-directed consumers prefer the text-based facts to 3D-based interactivity because they want utilitarian benefits from text-based information to obtain the rational facts from the information search so that their planned purchases can be successfully realized (Schlosser, 2003). On the other hand, experience-oriented (or pleasure) consumers seeking hedonic consumption benefits typically enjoy interacting with a mediated environment through chatting or games (Childers et al., 2001; Cotte et al., 2006). Even though experiential consumers prefer to use interactive 3D-based information that may not directly relate to products (Schlosser, 2003), they may use such experiential information as supplementary information to make a purchase decision because interactive 3D information can approximate direct experience which is arguably considered as the most influential on an actual purchase (Smith and Swinyard, 1988). Therefore, it is important to understand that mobile travelers are motivated differently when classifying mobile-based virtual information.

As shown in Figure 10, DMOs at the low innovative level should focus on developing simple mobile applications: verbal-based VE (Category 1) and still pictorial-based VE (Category 2). Verbal-focused mobile applications are preferred by both utilitarian and hedonic travelers. Text-based SMS and text chat can be persuasive for utilitarian. Mobile text chat can be also preferred by hedonic travelers. Even though Category 2 requires higher innovative level than Category 1, DMOs in $2G^2$ (second generation) mobile infrastructure still can provide MMS and MPM. Hedonic mobile travelers enjoy still pictorial-based VE more than utilitarian mobile travelers do.

Customized mobile applications by innovation level of DMOs and mobile user typology *Figure 10*



2.75G (e.g., EDGE and EGPRS) and 3G[3] (third generation, e.g., WCDMA, UMTS and HSDPA) mobile infrastructures provide Categories 3, 4 and 5 with a high-quality[4] streaming (e.g., 3D videos and video telephony). If DMOs have well-established IT infrastructure, three categories of VE can be all provided through mobile applications. Compared to Categories 1 and 2, Category 3 is non-interactive 3D VE which consists of mobile video message (MVM) and mobile TV (M TV). Those mobile applications can create richer experience for hedonic mobile travelers. Mobile applications in Category 4 can attract more utilitarian mobile travelers than hedonic because pictures or videos taken can be considered as personally meaningful messages to mobile travelers rather than just entertaining ones. For example, mobile travelers may take pictures or videos specifically relevant to their trip experiences and want to share their travel information within a mobile community on a real-time basis. Therefore, these applications (e.g., User Created Content) may be more attractive to the utilitarian than the hedonic. Category 5 can make mobile travelers more immersed in the virtual world and entertained than any other categories. Both hedonic and utilitarian mobile users prefer to use mobile applications in Category 5 as a purpose of entertaining or shopping experience (e.g., Second Life virtual world or virtual tour) due to the approximation of virtual world to reality.

Regarding the destination marketing towards mobile travelers, DMOs need to understand how to apply their own mobile strategies to augment the value-added travel experience for mobile travelers. For example, LBS-based navigation can be a main value-added mobile tourism service because available travel services often depend on spatial information (i.e., location) (e.g., tour stops for coordinating a bike tour) (Almer et al., 2004) and need timely information updates (Schmidt-Belz et al., 2003). More advanced mobile technologies can satisfy mobile tourists' additional expectations

through 3G or 4G[5] mobile networks because information-demanding tourists can download a large volume of information, data, pictures, videos, etc. via seamless mobile services (Ibrahim, 2002). In addition, DMOs should provide personalized mobile services that deliver bridged quantity of data and customized messages for mobile users who have small-screen phones and often receive many irrelevant messages (Ho and Kwok, 2003). Speech recognition technology can also provide another value-added service to overcome constraints of small screens and data entry difficulties by enabling mobile tourists to, for example, find out directions or retrieve information without touching screen or typing keys (Ringland and Scahill, 2003).

In terms of VEs discussed in this study, V-Tourism involves various travel activities based on the extent to which virtual travel experience can be achieved by using IT-based (especially mobile-mediated) applications. Therefore, the applicability issues arise: what roles VEs can play and how mobile applications can add the value to tourists' pre-trip, en-route, and post-trip travel experiences. To help understand these issues, the authors summarize various V-Tourism services based on 5 VE categories across three phases of a trip: pre-trip, en route, and post-trip (see Table 2).

- Pre-trip phase: Verbal-based VE helps tourists be aware of the destination through SMS promotion messages. Then, tourists actively seek travel information through UCC by watching destination photos and videos uploaded by other travelers. If more reliable information is needed, mobile travelers can have a mobile chat with others who visited the destination in mobile travel communities. When comparing alternative destinations, 3D based virtual tour can provide a pre-taste for a destination.
- En-route phase: When mobile travelers arrive at the destination, LBS-based navigation is a necessity to find roads, attractions, or restaurants. Mobile travelers can enjoy the destination through real-time video mobile phone calls with their friends. During a break or waiting time, they can forget their boredom by playing mobile 3D games.
- Post-trip phase: All VEs can reinforce mobile travelers' experience by stimulating their memories. DMOs can continue to provide customized special events or promotions through voice telephony, SMS or MMS. Travelers can leave their 'memories' on UCC communities or their individual blogs for communicating or sharing travel experiences. If they want to experience an animated trip in a similar destination, 3D-virtual Second Life world allows them to meet, talk, and even build their own resorts, hotels, etc. in a host community.

CONCLUSION AND FUTURE RESEARCH

Within the context of tourism, advanced mobile technologies extend the ability of travelers

Table 2: Examples of mobile applications in a v-tourism tour

	V-tourism tour		
Category of virtual experiences	*Pre-trip phase*	*En-route phase*	*Post-trip phase*
Verbal-based	• SMS pushing advertising alert	• Mobile chatting	• Voice telephony • Receiving SMS
Still pictorial-based	• Downloading photos from mobile communities	• Downloading photos from mobile communities	• Receiving multimedia message service
Non-interactive 3D-based	• Downloading photos from mobile communities	• Downloading photos from mobile communities	• Downloading video streaming
Interactive 2D/3D-based	• Downloading photos from mobile communities	• LBS-based navigation • Video telephony	• Mobile created content (create post-trip narratives as a reflection)
Animated 3D-based	• Virtual tour	• Mobile 3D games	• Animated second life

to experience a destination by providing access to the internet, get multimedia-based information, and trade m-Commerce (mobile commerce) in a 'one-stop shopping' experiential environment. This fact is echoed by Gratton (2007) who describes that wireless technology is commonly marketed as a tool that promotes mobility, transparency, and freedom, enabling users to roam from office, to café or restaurant, and even to the beach. Human's understanding of 'liberating' travel experience in association with the daily life has continued to be a research focus of many tourism and leisure scholars. As the new technologies transform the world into a mobile information society, the new mobile-enabled capabilities are changing the behaviors of the emerging mobile market and beginning to shape cultural values and norms in daily life (Lasica, 2007). Travel as a social phenomenon and economic activity in this global transformation deserves a new look and unique view – mobile-mediated virtual experience in tourism.

The traditional concept of virtual experience is generally confined in a mediated 3D environment. However, this study expands the concept of virtual experience to various mobile-mediated presentation formats (e.g., text, photos, 3D, and animation) on a real-time interaction basis. Some mobile travelers can virtually experience a destination by listening to mobile narratives while others can experience being in the destination through mobile text chat in mobile communities. Mobile-mediated virtual experience can be classified into five categories as follows: verbal-based VE (e.g., SMS, mobile text chat, and mobile voice message), still pictorial-based VE (e.g., MMS and MPM), non-interactive 3D-based VE (e.g., mobile TV and mobile video message), interactive 2D/3D-based VE (e.g., MCC, LBS and video telephony) and animated-based VE (e.g., virtual tour, mobile 3D games and animated Second Life).

Based on these categories, the authors explored how DMOs can confront with a variety of VEs. The innovativeness of DMOs can be influenced by situational determinants such as readiness of IT infrastructure, budget availability, and human resources. No matter where DMOs are situated, they need to approach mobile travelers by strategizing their current innovative competencies. If DMOs have a lower level of innovation with 2G mobile-based infrastructure available, verbal-based VE or pictorial-based VE can be provided for mobile travelers through SMS or MMS. On the other hand, DMOs with high innovative competencies (with 2.75G or above mobile capabilities) can provide non-interactive, interactive, and animated 3D virtual experience to different mobile user segments according to their experiential purposes. Moreover, in V-tourism context, value-added mobile services through DMOs' innovative capacity should be strategically developed to enhance awareness of a destination, satisfy travel experience, and create destination loyalty.

The concept of mobile-mediated V-Tourism proposed in the study established an important foundation to understand mobile applications for virtual experience in tourism. Built upon this foundation, future research is encouraged to examine the following areas for further theoretical and practical contributions.

First, it should be examined whether the proposed five VE categories are in fact appropriately grouped because the authors classified them based on subjective qualitative characteristics and expert opinions. To understand sub-categories for each VE construct, Delphi studies as qualitative approach is recommended. A group mobile expert panel along with users can be solicited and asked to recommend which mobile application belongs to which VE category by rating the scale ranging from 'not recommended at all' to 'strongly recommended' (Yoo and Donthu, 2001). Then, confirmatory studies can be empirically performed to examine whether the chosen items represent the latent VE construct and whether the proposed VE classification scheme is both conceptually sound and empirically confirmed. As a result, the reliable and valid measurement can be established for further applications.

Second, according to various communication models (e.g., Elaborated Likelihood Model) suggested by previous literature (Karson and Fisher, 2005; Petty et al., 1983; Schlosser, 2003), consumers who seek utilitarian benefits (e.g., shopping) want factual-based meaningful

messages (2D/text-centric information) as central cues associated with cognitive or discursive process, whereas those who seek hedonic benefits (e.g., amusement) want feeling-based product-irrelevant messages (e.g., interactive 3D-based games) as peripheral cues associated with non-cognitive or imagery process. From a practical marketing perspective, DMOs can design their mobile communication cues (i.e., stimuli) accordingly to motivate mobile tourists for more product (destination) involvement. In this regard, future research needs to investigate how the five categories of mobile-mediated VEs are differently perceived by mobile users (hedonic vs. utilitarian) to determine their roles (central cues vs. peripheral cues) in mobile-mediated communication process. The findings of such experimental design study will provide insights for practical destination marketing practices.

Finally, the competition of DMOs for tourist arrivals is accelerated by the new technologies. More and more DMOs have taken advantage of various technologies to communicate with new breeds of tourists beyond the traditional destination marketing tactics (e.g., tourist information centers, promotional print materials, etc.). The main battlefield is becoming web-enabled tourism marketing and services in attracting more tourists throughout their entire travel process. For destination marketers, the unique feature of 'consumer mobility' makes the mobile-mediated environment an important strategic extension of the internet marketing practices. It is evident that the mobile medium is expected to become one of mainstream media such as TV or Radio, as the Aspen Institute reported that 750 million mobile phones were astonishingly sold during 2005 around the globe (Lasica, 2007). Furthermore, Ling et al. (2006) predict that the number of worldwide mobile users would reach 1 billion by 2009. However, constraints including lack of financial resources and less developed IT infrastructures often can hinder DMOs and local businesses from developing effective mobile marketing strategies. Therefore, it is critical for future research to carefully identify potential barriers and facilitators for mobile-mediated destination marketing and to propose a cooperative business model of V-Tourism for DMOs and local entrepreneurs.

The general mobile-mediated business model can be developed, for example, following the methodology for business model evolution proposed by Pateli and Giaglis (2003). The methodology particularly considers the influence of technology innovation into the model development through three phases: understand, identify technology's influence, and change. In addition, various types of the business model can be explored by investigating six main m-commerce business models identified by Devine and Holmqvist (2001): the user fee model, the shopping model, the marketing core business model, the improved efficiency model, the advertisement model and the revenue-sharing model. In the user fee model, users are charged for access to mobile contents through third billing party while in the shopping model, users directly shop from the content providers through mobiles. In the marketing core business model, content providers use mobile advertisement as a marketing tool to reach customers better for their core business which is not about mobile content. In the improved efficiency model, content providers use mobile function to control operational costs of their core business better and in the advertisement model, content providers receive fees from advertising companies. Lastly, in the revenue-sharing model, content providers are not content owners, thus they share revenue with content owners. It is also encouraged to examine not only each of the six models, but a certain combinations of them. Following the business model development, further empirical studies such as discovering tourists' acceptable price ranges for mobile-mediated VEs will be required to shed more light on the proposed business model.

NOTES

1. M (Mobile); MMS (Multimedia Message Service); MPM (Mobile Photo Message); SMS (Short Message Service); LBS (Location-Based Service); MVM (Mobile Video Message)
2. Second generation mobile infrastructure provides very basic wireless services such as Global System for Mobile Communications (GSM) or Time Division Multiple Access (TDMA).

3. 3G means the third generation mobile infrastructure including Universal Mobile Telecommunication System (UMTS), Wide-Band Code Division Multiple Access (WCDMA), High-Speed Downlink Packet Access (HSDPA), etc.
4. 2.75 generation mobile infrastructure include Enhanced Data Rate for GSM Evolution (EDGE) and Enhanced GPRS (EGPRS).
5. Fourth generation mobile infrastructure includes Ultra Mobile Broadband (UMB), Worldwide Interoperability for Microwave Access (WiMAX), etc.

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