DIGITAL IDENTITY MANAGEMENT AND SATISFACTION WITH VIRTUAL TRAVEL COMMUNITIES

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Virtual communities are emerging as an effective marketing tool with increasing number of technologies supporting online communications. This study proposed that members’ satisfaction with virtual travel communities (VTCs) is positively influenced by their perception of, attitude towards, and trust in digital identity management (DIM) system employed in VTCs and tested the model using SEM analysis. The study found that perceptions of DIM have a positive effect on attitude and trust which, in turn, positively influences satisfaction. The results of the study are useful for travel organizations, as well as technology designers, who are considering using VTCs as one of their online marketing strategies.

Key words: Digital identity; Virtual travel communities; Trust; Satisfaction; Structural equation model

Introduction

Entirely new social environments and mechanisms, such as email, virtual communities, blogs, wikis, and role-playing games, have emerged in the last 10–15 years with the growth of the Internet and revolutionized the way people socialize, exchange information, access resources, and make transactions. Some of these environments (e.g., virtual communities) are rapidly becoming a viable business model for companies and organizations, because these communities bring together people of similar interests (Kozinets, 1998; Rothaermel & Sugiyama, 2001; Wang & Fesenmaier, 2004). The travel industry, one of the first industries to go online, has long recognized the potential of virtual travel communities (VTCs) for destination and product promotion. Virtual travel communities make it easier for people to obtain information, maintain connections, develop relationships, and, eventually, make travel-related decisions. Effectively designed and managed virtual communities contribute to stronger customer satisfaction, which can result in higher spending on travel-related products and services, customer retention, and, given the information-intensive nature of tourism products, decrease in promotional costs providing economic gains to both the com-
munities’ organizers and its members (Buhalis, 1998; Rothaermel & Sugiyama, 2001; Wang, Yu, & Fesenmaier, 2002). However, the successful operation of a virtual community requires a thorough understanding of what brings people into virtual communities in the first place, what their underlying needs are, what social laws govern virtual communities, and what technology it should implement to support its functions (Wang et al., 2002). If end users are not satisfied with how the community functions, managed or are unable to effectively use the technology, the successful application of VTCs may be at risk and result in loss of members. This research was designed to contribute to the understanding of what factors are important for end users’ satisfaction with VTCs; particularly, how the end users’ perceptions of digital identity management system adopted in a VTC contribute to satisfaction with this community.

The article is organized as follows. Section 2 discusses the essential aspects of VTCs, extension of personal identity to digital identity in an online environment, and also reviews relevant publications in these areas. Section 3 deals with the notion of digital identity management in virtual communities and suggests a conceptual model of members’ satisfaction with VTCs. This section provides the rationale for such antecedents of member satisfaction as perception of, attitude towards, and trust in digital identity management system employed in virtual communities. Section 4 presents the empirical results of SEM analysis, while the last section summarizes the conclusions.

STUDY BACKGROUND
Virtual Travel Communities

The most often sited definition of a virtual community, first given by Rheingold (1993), is that of,

social aggregations that emerge from the Net when enough people carry on public discussions long enough, with sufficient human feelings, to form webs of personal relationships in cyberspace. A virtual community is a group of people who may or may not meet one another face to face, and who exchange words and ideas through the mediation of computer bulletin boards and networks. (pp. 57–58)

Rothaermel and Sugiyama (2001) points out that a virtual community has common aspects with a community of mind described by Tonnies (1967), but without the bounding influence of space and time. Virtual communities are also similar to an organizational community defined by Lawrence (1995), wherein the process of social interaction community members follow a certain behavioral code accepted by the community. Hagel and Armstrong (1997) stress the social aspect of virtual communities, when, unrestrained by space and time, people can get together online to meet their psychological and/or commercial needs. Summarizing Preece’s (2000) definition of virtual communities, Wang et al. (2002) state that a virtual community generally include four elements: (1) people who communicate with one another as they attempt to satisfy their needs or perform particular roles; (2) a shared purpose on which the community is based—whether it be a common interest, special need, or information exchange; (3) guiding rules of communication within the community, or communication policy; and (4) implemented technology which supports, mediates, and facilitates the communication process in the community.

As the travel industry experiences strong growth, travel planning, and booking are among the most popular online activities (Wang et al., 2002). The World Travel & Tourism Council (WTTC) estimates that the travel industry is expected to grow 4.6% (real terms) worldwide, to total US$6,477 billion of economic activity in 2006 (World Travel & Tourism Council [WTTC], 2006). The 10-year (2007–2016) annualized growth forecast is predicted at 4.2% per annum with the online portion of those sales growing at an explosive rate, especially in Europe and the Asia-Pacific region (Travel Industry News, 2006). In the US, currently 9 out of 10 consumers used the Web in the summer of 2005 to plan trips or purchase travel (European Travel Commission [ETC], 2006). VTCs can provide tourism organizations with a more effective method for communicating products and services with the result being increased brand awareness and strengthened brand associations (Kim, Lee, & Hiemstra, 2004; Wang et al., 2002).

To build a strong VTC that facilitates communication, information exchange, and, ultimately, transactions, an effective system of interrelated
technology solutions, which supports the above-mentioned purposes, must be in place. For example, the system implemented by virtualtourist.com administers end user authentication, access rights and restrictions, account profiles, passwords, and other attributes. This system is enforced by moderators and also regulates the style of communication among participants, accepted conduct, privacy and security policies, and repercussions for non-compliance with community rules (Wang et al., 2002). Dealing with all these issues in virtual communities is a complex task as it involves not only technical but also social and psychological aspects. Wellman and Gulia (1999) identified a number of key questions important for comprehension of virtual community social phenomenon: for example, how “virtual” and “real life” relationships differ; to what extent intimate relationships are possible in cyberspace; whether support given online is reciprocated; how communication norms are developed; how community architecture affects the nature of virtual community; and some others. These questions are closely tied to one important aspect of virtual community, namely, digital identity of its members. All virtual interactions require digital representations of human identity in online environment, making this aspect crucial to successful community functioning. Besides, three out of four aspects of virtual community identified by Preece (2000) are closely connected to digital identity and its management as well, supporting the argument that digital identity and its management is a fundamental concern for successful design and operation of virtual communities.

Personal and Digital Identities

In general, personal identity refers to names, addresses, credit cards, and such documents as passports, birth certificates, etc., which serve as the main distinction between people and prevent confusing one individual with others (Pato, 2003). From the classic works of Adam Smith, Sigmund Freud, and George H. Mead, psychological tradition views identity as several distinct realms within one united domain of an individual’s sense of self. The separation of identity into internal and projected goes back to Mead’s (1934) famous work Mind, Self and Society on social foundation of self. Mead considers “I” as outward directed acting self and “me” and internal self. Both “I” and “me” relate to social experience. But the “I” is the response of the organism to the attitudes of the others; the “me” is the organized set of attitudes of others which one assumes. Boyd (2002) and Nabeth (2005) argue that people construct their personal identity into two main aspects—explicit and implicit. While communicating with others, people project aspects of their identity through a set of signals intended for others to read and evaluate, thus forming their explicit identity. For example, people adjust their posture, body language, vocabulary, and general presentation to convey appropriate information about themselves. Implicit identity refers to an individual’s self-perception in relation to their past experiences and the environment. Implicit identity is entirely constructed and maintained by the individual, although it can be involuntarily projected by an individual. Goffman (1959), in his analysis of social interactions, distinguishes between the “expressions given” and the “expressions given off.” As concisely conveyed by Donath (1998),

The former (expression given) are the deliberately stated messages indicating how the one wishes to be perceived; the latter (expression given off) are the much more subtle—and sometimes unintentional—messages communicated via action and nuance. Both forms of expression are subject to deliberate manipulation, but the “expression given off” may be much harder to control. One can write “I am female,” but sustaining a voice and reactions that are convincingly a woman’s may prove to be quite difficult for a man. (p. XX)

In online environments personal identity concept is transformed into what is known as a digital identity of a user. Digital identity provides new possibilities for communication and transactions over distant spaces, but the fundamental idea and aspects of identity remain the same: digital identity is meant to maintain the ease of use and trustworthiness of “real life” communications and transactions while providing the security and accountability for communication and transactions online. Two separate realms of digital identity, explicit and implicit, exist, though transformed, in the online environment as well. In virtual commu-
nities, for example, the explicit identity can be declared by simply filing a user profile; however, one can restrict access to certain parts of declared identity to certain people. Online implicit, or implicit social, identity is projected through a person’s online behaviors (posting, conversations, and actions) and social network one establishes online over time. Contrary to the real world, pieces of one’s implicit identity are often recorded in the digital system (e.g., log files) (Nabeth, 2005).

In virtual communities, to evaluate the quality of interactions one needs to know the identities of one’s communication partners (Donath, 1998). However, in cyberspace in general and in virtual communities in particular, identities are vague, because many signals about a personality that are present in the physical world are missing; therefore, it is often difficult to check the authenticity of the information declared by a user, and to trust the validity of the declared/explicit identity (Donath, 1998; Kollock, 1999; Nabeth, 2005). Thus, assessing the reliability of information and the trustworthiness of a communication partner is often conducted through analysis of a person’s implicit identity (i.e., posts, communication style, consistency of voice, etc.) and further comparisons of this information against the stated explicit identity in order to construct a more complex digital identity of a particular user.

Digital Identity Management and Satisfaction With VTCs: Proposed Model

Digital identity management (DIM) is, “the set of processes, tools, and social contracts surrounding the creation, maintenance and termination of a digital identity for people or, more generally, for systems and services to enable secure access to an expanding set of systems and applications” (Pato, 2003, Para. 1). In virtual environments, DIM’s purpose is multifunctional: among other things it protects privacy, guards against identity theft, provides convenience of customization for online buyers, and is responsible for accountability of parties in online relationships. Because one of the main functions of virtual communities is to facilitate communication among members, an active, live VTC can be built based on an adequate DIM system (Preece, 2000). Little research has been done to explore social and psychological responses of end users toward DIM systems implemented in VTCs and how these responses contribute to members’ general satisfaction with VTCs. This study, therefore, was designed to contribute to the understanding of what factors are important for end users’ satisfaction with VTCs and proposes a conceptual model that integrates such constructs as perception of DIM by end users, as well as trust in and members’ attitude towards DIM in VTCs with members’ satisfaction with VTCs. In the model, DIM construct is considered from three perspectives:

1. **Perceived explicit digital identities** (what we can directly see about a person in online environment). This DIM aspect refers to what end users declare about themselves and how helpful this information is for communication or other purposes of end users. Explicit identity component of DIM is thought to be assessed by VTC members from the perspective of how much control a member has over their declared information and whether the management of explicit identity is conducive to the main purpose of VTCs.

2. **Perceived implicit digital identities** (what we can infer from communications). This DIM component is not so easy to capture, and it generally refers to the solutions implemented in VTC that are supportive of making inferences about other people’s implicit identities. This component is thought to be conducive of making inferences about consistency of user’s voice online, network of social relationships that people establish in VTCs, member’s social status, as well as a person’s communication history.

3. **Technology component** (how we evaluate technical side of VTC that supports communications and/or transactions). The technology component is seen to serve as a facilitator of a main purpose of virtual community (e.g., communication or selling–buying transactions). It includes VTC interface and technology solutions to such acts as end user authentication, access rights and restrictions, passwords, etc. Technology component refers to user’s convenience of using VTC and performing opera-
tions related to users’ purposes of being in VTC.

The proposed model (Fig. 1) adapted the theoretical construct of service quality to the electronic environment of VTCs, with the view that a DIM system implemented by a VTC provides a fundamental service to community members, crucial to the successful functioning of the community as a whole, and thus its services can be evaluated by exploring its quality aspects. The proposed model is then operationalized and tested using structural equation modeling. The studied model relationships were stated as six research hypotheses:

**H1:** End users’ perception of DIM system implemented in VTC is a function of three factors: perceived explicit digital identity, perceived implicit digital identity and technology component.

**H2:** End users’ perception of DIM system has a positive influence on their attitude towards DIM.

**H3:** End users’ perception of DIM system has a positive influence on their trust in DIM.

**H4:** End users’ perception of DIM system has a positive influence on their satisfaction with VTC.

**H5:** End users’ attitude towards DIM has a positive influence on their satisfaction with VTC.

**H6:** End users’ trust in DIM has a positive influence on their satisfaction with VTC.

**DIM Measurement in VTCs**

A positive relationship is often assumed to exist between service quality and customer satisfaction in offline and online contexts, and usually satisfaction is considered as an outcome of service quality (Bowen & Clarke, 2002; Shankar, Smith, & Rangaswamy, 2000). By adapting and extending traditional service quality dimensions in cyberspace, online service can be viewed as a self-service technology where customers serve themselves without the involvement of company’s employees. In a traditional service setting, customers are often thought to base quality judgments mainly on evaluations of the physical aspects of the service provider and their interactions with service employees (Bitner, 1992; Li, Tan & Xie, 2003). In online services, however, customers deal with employees only when special help is needed interacting almost exclusively with technology and digital objects. Therefore, it can be assumed that online quality perceptions are based largely on evaluations of interactions with other members’ digital

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*Figure 1. Model of DIM and satisfaction with VTC.*
identities and the technology used in these communications.

The most popular measure of service quality is SERVQUAL, an instrument developed by Parasuraman, Zeithaml, and Berry (1998) in a number of studies. In the SERVQUAL model, service quality is defined as a function of the gap between a customer’s expectations of a service and his or her perceptions of the actual service delivered by the organization. SERVQUAL has five dimensions: (1) reliability, that is the ability to perform the promised service dependably and accurately; (2) responsiveness, that is willingness to help customers and provide prompt service; (3) assurance, which is characterized by employees’ knowledge and courtesy and their ability to inspire trust and confidence; (4) empathy, that is caring, individualized attention given to customers; and (5) tangibles, which are understood as appearance of physical facilities, equipment, personnel, and written materials. In measuring how end users perceive explicit and implicit digital identities in VTCs the first four dimensions of SERVQUAL were amended and applied to this study. To measure how end users perceive technology component implemented in VTC, four items were created based on the tangibility dimension of the SERVQUAL instrument (Table 1).

**Satisfaction with VTCs**

Customer satisfaction is viewed by scholars as a principal factor to the success of organizational profitability (Anderson & Srinivasan, 2003; Bittner, Brown, & Mueter, 2000). Satisfaction is best understood as ongoing comparative evaluations of what was expected prior to the consumption experience and the actual level of product/service acquisition (Oliver, 1997). E-satisfaction as a construct has gained increasing importance in the marketing literature recently, and research on the loyalty of Internet retail customers placed e-satisfaction as central to understanding intended behavior of Internet channel customers (Anderson & Srinivasan, 2003; Mills & Morrison, 2003; Winer, 2001). Adopting a broad definition of e-service and the role of service over the Internet, Rust and Lemon (2001) argue that improving e-service capabilities would enable a firm to develop better relationships with their customers and that customer satisfaction should become the overall goal of a firm’s CRM program. Consumer satisfaction in an online environment is viewed as an important predictor of customer loyalty, which, in turn, leads to a firm’s successful performance and economic vitality (Anderson & Srinivasan, 2003; Taylor & Hunter, 2002; Winer, 2001).

Extending Oliver’s (1997) definition to the VTC context, end users’ satisfaction can be termed as an evaluative response to the overall performance of the virtual community. Satisfaction is therefore a judgment that information and services obtained from a VTC as well as inner needs are fulfilled by participation in a VTC thereby providing a pleasurable level of gratification to community members. While the expectancy-disconfirmation theory considers satisfaction as primarily a cognitive process, a number of studies indicate that not only expectations and overall judgments but also affective evaluations contribute considerably to customer satisfaction response (Mano & Oliver, 1993; Oliver, 1993; Westbrook & Oliver, 1991). In this research four items measured satisfaction of end users with VTCs including measurement of the expectation component, affective component, and overall judgment (Table 1).

**Attitude Towards DIM**

Satisfaction judgments are often influenced by positive and negative customers’ attitudes (Mano & Oliver, 1993; Westbrook & Oliver, 1991). Attitude is a stable affect similar to judgment that a product/object has desirable or undesirable properties (Cohen & Areni, 1991). As formulated by Eagly and Chaiken (1993), attitude is, “a psychological tendency that is expressed by evaluating a particular entity with some degree of favor or disfavor” (p. ##). A number of researchers recognized multidimensionality of the attitude construct, which consists of: (1) the emotional response, which, however, has a positive or negative value; (2) the cognitive beliefs; and (3) the behavior towards a certain entity (Eagly & Chaiken, 1992; Olson & Zanna, 1993). Strengths of one’s attitudes towards an issue have been identified as one of the fundamental topics for attitude studies. An overall consensus found that strong attitudes
### Table 1
Model Constructs

<table>
<thead>
<tr>
<th>Item No.</th>
<th>Survey Item</th>
<th>Construct</th>
<th>Aspect</th>
<th>Source</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Other members’ profile provides adequate information to me.</td>
<td>Perceived explicit DI</td>
<td>Reliability</td>
<td>Parasuraman et al. (1988)</td>
</tr>
<tr>
<td>2</td>
<td>Posts in this community are carefully edited by their writers.</td>
<td>Perceived explicit DI</td>
<td>Responsiveness</td>
<td>Parasuraman et al. (1988)</td>
</tr>
<tr>
<td>3</td>
<td>Information provided in other members’ profile looks authentic to me.</td>
<td>Perceived explicit DI</td>
<td>Assurance</td>
<td>Parasuraman et al. (1988)</td>
</tr>
<tr>
<td>4</td>
<td>The “voice” of members in their posts is consistent with the information in their profile.</td>
<td>Perceived explicit DI</td>
<td>Empathy</td>
<td>Parasuraman et al. (1988)</td>
</tr>
<tr>
<td>5</td>
<td>Members’ behavior remains consistent over time in this community.</td>
<td>Perceived implicit DI</td>
<td>Reliability</td>
<td>Parasuraman et al. (1988)</td>
</tr>
<tr>
<td>6</td>
<td>The social relationships that members establish with each other remain stable over time.</td>
<td>Perceived implicit DI</td>
<td>Reliability</td>
<td>Parasuraman et al. (1988)</td>
</tr>
<tr>
<td>7</td>
<td>Messages posted in this community reflect members’ attitude.</td>
<td>Perceived implicit DI</td>
<td>Responsiveness</td>
<td>Parasuraman et al. (1988)</td>
</tr>
<tr>
<td>8</td>
<td>I feel that in this community members care about their relationships with other members.</td>
<td>Perceived implicit DI</td>
<td>Empathy</td>
<td>Parasuraman et al. (1988)</td>
</tr>
<tr>
<td>9</td>
<td>I can find information about the length of time a member has stayed in this community.</td>
<td>Technology component</td>
<td>Tangibles</td>
<td>Parasuraman et al. (1988)</td>
</tr>
<tr>
<td>10</td>
<td>Members must reveal enough information about their travel experience in their personal profile to join this community.</td>
<td>Technology component</td>
<td>Tangibles</td>
<td>Parasuraman et al. (1988)</td>
</tr>
<tr>
<td>11</td>
<td>I can easily find out if a member actively participates in this community.</td>
<td>Technology component</td>
<td>Tangibles</td>
<td>Parasuraman et al. (1988)</td>
</tr>
<tr>
<td>12</td>
<td>This community has strict requirements on how much demographic information a member needs to provide in their profile.</td>
<td>Technology component</td>
<td>Tangibles</td>
<td>Parasuraman et al. (1988)</td>
</tr>
<tr>
<td>13</td>
<td>I can always obtain information I need from members in this community.</td>
<td>Attitude</td>
<td>Commitment</td>
<td>Pomerantz et al. (1995)</td>
</tr>
<tr>
<td>14</td>
<td>Communication with members in this community represents a significant percentage of my overall online experience.</td>
<td>Attitude</td>
<td>Embeddedness</td>
<td>Pomerantz et al. (1995)</td>
</tr>
<tr>
<td>15</td>
<td>The idea of seeking information through this community is appealing to me.</td>
<td>Attitude</td>
<td>Positive emotion</td>
<td>Eagly &amp; Chaiken (1992); Liljander &amp; Stradnik (1997)</td>
</tr>
<tr>
<td>16</td>
<td>I often tell my friends about my experiences with members in this community.</td>
<td>Attitude</td>
<td>Embeddedness</td>
<td>Pomerantz et al. (1995)</td>
</tr>
<tr>
<td>17</td>
<td>I am cautious with the information provided by other members.</td>
<td>Trust</td>
<td>Integrity</td>
<td>Doneym &amp; Connor (1997); Jarvenpaa et al. (2000)</td>
</tr>
<tr>
<td>18</td>
<td>I consider this community trustworthy compared with other travel-related websites.</td>
<td>Trust</td>
<td>Overall judgment</td>
<td>Doneym &amp; Connor (1997); Jarvenpaa et al. (2000)</td>
</tr>
<tr>
<td>19</td>
<td>There is too much uncertainty associated with the members in this community.</td>
<td>Trust</td>
<td>Competence</td>
<td>Doneym &amp; Connor (1997); Jarvenpaa et al. (2000)</td>
</tr>
<tr>
<td>20</td>
<td>Members in this community are trustworthy.</td>
<td>Trust</td>
<td>Overall judgment</td>
<td>Doneym &amp; Connor (1997); Jarvenpaa et al. (2000)</td>
</tr>
<tr>
<td>21</td>
<td>I consider my choice to participate in this community a good one.</td>
<td>Satisfaction</td>
<td>Affective status</td>
<td>Oliver (1997)</td>
</tr>
<tr>
<td>22</td>
<td>I continue to participate in this community because other online communities are not as good as this one.</td>
<td>Satisfaction</td>
<td>Affective states</td>
<td>Oliver (1997)</td>
</tr>
<tr>
<td>23</td>
<td>So far, how has your experience met your expectation in this community?</td>
<td>Satisfaction</td>
<td>Expectation</td>
<td>Oliver (1997)</td>
</tr>
<tr>
<td>24</td>
<td>Based on all of your own experience, how satisfied overall are you when you communicate with other members in this community?</td>
<td>Satisfaction</td>
<td>Overall judgment</td>
<td>Oliver (1997)</td>
</tr>
</tbody>
</table>
result in selective cognitive processing, which tends to interpret ambiguous information in favor of one’s beliefs, persist over time, and can predict one’s behavior (Abelson, 1988; Chaiken, Pomerantz, & Giner-Sorolla, 1995; Eagly & Chaiken, 1993; Krosnic, Boninger, CHuang, Berent, & Carnot, 1993; Olson & Zanna, 1993). Pomerantz, Chaiken, and Tordesillas (1995) measured attitude strength on several dimensions and noted the existence of two factors underlying attitude: Commitment and Embeddedness. The former indicates the degree to which one feels positive that one’s opinion concerning a certain entity is correct and the likelihood of attitude change. The latter, on the other hand, indicates how one is personally involved with an issue and how well it represents the one’s value system.

Extending the general definition of the attitude construct to the context of a VTC environment, members’ attitudes can be defined as a psychological tendency to evaluate performance of the community with some degree of favor or disfavor. In this study, the measurement of end users’ attitudes towards DIM included four items that were based on the findings from several studies. Pomerantz et al. (1995) dimensions of the attitude construct—Commitment and Embeddedness—were adapted for a case of VTCs. The Commitment dimension reflected how strongly members felt about informational exchange, one of the main functions that DIM has to maintain. The Embeddedness dimension was measured by two items that indicated to what degree end users were involved with the online interaction with other community members and were personally attached to their VTC. The fourth item measured an emotionally positive dimension of attitude, which is highly important to customer satisfaction, as indicated by Eagly and Chaiken (1992) and Liljander and Strandvik (1997) (Table 1).

**Trust in DIM**

While an understanding of customer satisfaction has been advanced significantly by a number of studies, more research is needed to identify factors driving online satisfaction, especially the trust–satisfaction link (Anderson & Srinivasan, 2003; Grabner-Krauter & Kalusha, 2003; Reichheld & Schefter, 2000; Singh & Sirdeshmukh, 2000; Szymanski & Hise, 2000). Gundlach and Murphy (1993) contend that, “the variable most universally accepted as a basis of any human interaction or exchange is trust” (p. ##). Trust has been viewed as a central element in a variety of communication contexts. Reichheld and Schefter (2000) stated that, “to gain the loyalty of customers, you must first gain their trust” (p. ##). However, to trust online companies requires more on the part of a customer than to trust “brick and mortar” firms. The importance of trust in electronic environments is increased by the lack of physical contact characteristic of online social exchange (Reichheld & Schefter, 2000). Mayer and colleagues (1995) offered four main pillars of social exchange that are necessary to build and maintain trust: (1) competence, which means that the trustor believes in the trustee’s ability and power to do what needs to be done; (2) predictability, which implies that the trustor can reasonably predict the trustee’s behavior regarding the action to be taken; (3) benevolence, which summarizes the trustor’s impression that the trustee is motivated to act in the trustee’s interest; and (4) integrity, which means that the trustor believes that the trustee will act in an ethical way and keep his/her promise.

Communication activities and information exchange is the lifeblood for VTCs (Wang & Fesermeier, 2004). Sharing personal stories, seeking a companion for a trip among fellow community members, or collecting references about a travel product all require trust if social behavior or any action is to be based upon obtained information. Trust needs to be created among community members, because every member can act as information source, and between members and community management, because the latter hold important role in maintaining the communication process by implementing and managing the DIM systems. In a context of exchange of travel-related information, first-hand knowledge about a destination (competence) and honesty in relating travel experiences (integrity) provide value for members and contribute to the overall judgment of community trustworthiness. Conceptualization of the trust construct suggested by Mayer, Davis, and Schoomlan (1995) was adapted and used in a number of studies on satisfaction with e-commerce and its
drivers (Doney & Conn, 1997; Javenpaa, Tractinsky, & Vitale, 2000; Koufaris & Hampton-Sosa, 2004). In this study, measurement of trust included four items representing competence and integrity dimensions of the construct, as well as the overall perception of trust with regard to a particular community. To increase the face validity of the measurement instrument, the relevant items were taken from the previous studies of Jarvenpaa et al. (2000) and Doney and Cannon (1997) and adapted to the context of communication exchange in VTC environment. Table 1 summarizes the measurement of the model constructs.

Survey and Sample

A questionnaire of 24 items measuring constructs of DIM, attitude, trust, and satisfaction was generated based on the related literature. Survey items used a 5-point Likert-type scale ranging from “strongly disagree” to “strongly agree” (items 1 through 22), “much worse that expected” to “much better than expected” (item 23), and “very dissatisfied” to “very satisfied” (item 24). The survey questionnaire was published on a secure Web server and a database was constructed on the same server to receive and store the online responses automatically. Popular VTCs were first identified using Google.com. Searching words, “Virtual Travel Community” and “Travel Community,” were inputted as key words and the top 10 VTCs were selected for further contact. An invitation email was sent out to the managers asking for cooperation, and seven responded positively. A brief description of the VTCs used in this study is provided in Table 2. An invitation message was posted on VTC forums asking the members to participate in the study, and a daily follow-up message was posted during the 15-day data collection phase to report the progress of the survey to all community members. An electronic counter was added to the survey website to calculate the number of viewers of the invitation. An incentive reward was offered to stimulate more responses: five participants were randomly selected to receive a travel guidebook of their choice (maximum value US$40).

In total, 202 complete responses were obtained. Response rate was calculated as the ratio between the number of individuals who actually finished the survey (202) and the total number of hits (712), which resulted in the response rate of 28.37%. This was sufficient to meet the sample size requirement of 200 (Hoelter, 1983). The data was screened for irregularities such as missing data, and duplicated entries: in total, seven missing values were found for six items, and there were no duplicated entries. Mean imputation was substituted for missing values. Prior to imputing the mean, items 17 and 19 were recoded to keep consistent with the pattern of the 5-point Likert scale. In examining the normality of the data, the mean, standard deviation, skewness, and kurtosis were calculated and no abnormalities were detected. When checking the relationship between the independent variables, no significant problems of multicollinearity was found as the Pearson’s index were all less than 0.70. Cronbach’s alpha for all 24 items as a measure of internal consistency was 0.89. Thus, the data were judged adequate for conducting the SEM analysis.

Results

Exploratory Data Analysis

Statistical Packages for the Social Sciences (SPSS 12.0) software was employed during the

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<thead>
<tr>
<th>Name of the VTC</th>
<th>No. of Members</th>
<th>Time of Establishment</th>
<th>URL Link</th>
</tr>
</thead>
<tbody>
<tr>
<td>Boots’nAll</td>
<td>200,000</td>
<td>March 1999</td>
<td><a href="http://www.bootsnall.com">www.bootsnall.com</a></td>
</tr>
<tr>
<td>GOLOBOsapiens</td>
<td>15,289</td>
<td>August 2001</td>
<td><a href="http://www.globosapiens.net">www.globosapiens.net</a></td>
</tr>
<tr>
<td>IgoUgo</td>
<td>350,000</td>
<td>June 2000</td>
<td><a href="http://www.igougo.com">www.igougo.com</a></td>
</tr>
<tr>
<td>Travellerspoint</td>
<td>45,493</td>
<td>June 2002</td>
<td><a href="http://www.travellerspoint.com">www.travellerspoint.com</a></td>
</tr>
<tr>
<td>I travel You travel</td>
<td>5,949</td>
<td>September 2001</td>
<td><a href="http://www.ityt.com">www.ityt.com</a></td>
</tr>
<tr>
<td>TravelBanter</td>
<td>311</td>
<td>2000</td>
<td><a href="http://www.travelbanter.com">www.travelbanter.com</a></td>
</tr>
<tr>
<td>Traveler’s Cafe</td>
<td>1,449</td>
<td>1997</td>
<td><a href="http://www.attitudetravel.com">www.attitudetravel.com</a></td>
</tr>
</tbody>
</table>
exploratory data analysis procedure. Principal component analysis (PCA) was first used on attitude towards DIM, trust in DIM, and satisfaction with VTCs and then on DIM construct to examine the underlying dimensions of these constructs and see the loadings of the proposed measurement items. The initial PCA for attitude towards DIM, trust in DIM, and satisfaction produced loading in the range of 0.55 to 0.76. All eigenvalues were greater than 1; the percentage of total variance explained ranged from 60.49% to 71.99%. KMO results were greater than 0.5. The Bartlett’s test for all factors was significant at 0.0001 level. “Weak” items 14, 17, and 22 were removed from the dataset. Then initial PCA on the three DIM construct components (perceived explicit and implicit digital identities, and perceived technology component) was conducted in order to examine the proper loading of each item on the three factors. The initial PCA for perception of DIM produced loading ranging from 0.50 to 0.76 with all eigenvalues greater than 1. The percentage of total variance explained ranged from 59.15% to 76.37%. KMO results were all greater than 0.5. The Bartlett’s test for all factors was significant at 0.0001 level. The results of the initial PCA for perception of DIM, as well as for attitude towards DIM, trust in DIM, and satisfaction with VTC constructs are summarized in Table 3.

Secondly, exploratory PCA with Varimax rotation and Kaiser Normalization was conducted on the original 12 items of the DIM construct to determine which items, if any, need to be dropped in order to summarize most of the original variance into a minimum number of items and if any of the original 12 items within a given factor loaded on any of the other factors. “Weak” items 7 and 11 were removed from the dataset. The remaining 10 items were organized according to their loading on each of the three factors. Eigenvalues for the three factors ranged from 1.55 to 2.25. The total percentage of variance explained was 58% and the Cronbach’s alpha was 0.724. The results of the second exploratory PCA analysis for perception of DIM in VTCs are shown in Table 4.

**Confirmatory Factor Analysis**

Following the PCA procedure, Confirmatory Factor Analysis (CFA) was conducted in order to investigate the “goodness-of-fit” of the proposed model. Analysis of Moment Structure (AMOS 4.0) software was used to perform the CFA and the final structural equation modeling (SEM). The CFA for perception of DIM was conducted in two steps: first-order and second-order CFA. Maximum likelihood estimation with covariance matrix was used to perform the analysis. The initial first-order CFA model produced $\chi^2(32) = 32.675$, $p = 0.434$; GFI = 0.97; AGFI = 0.94; CFI = 0.998; RMSEA = 0.01. The results indicated that the first-order model fitted the data well. The standardized residual covariances displayed no unusually large estimates. Correlation between perceived explicit perceived implicit digital identity constructs was 0.78, correlation between perceived explicit digital identity and technology component was 0.34, and correlation between perceived implicit digital identity and technology component was 0.27. In the second-order CFA for perception of DIM, the model produced excellent fitting with $\chi^2(32) = 30.60$, $p = 0.537$; GFI = 0.97; AGFI = 0.95; CFI = 1.000; RMSEA = 0.000. All

---

### Table 3

<table>
<thead>
<tr>
<th>Variables</th>
<th>Factor Loading</th>
<th>Eigenvalue</th>
<th>Variance Explained (%)</th>
<th>KMO</th>
</tr>
</thead>
<tbody>
<tr>
<td>Perceived explicit DI</td>
<td>0.53–0.67</td>
<td>1.77</td>
<td>59.15</td>
<td>0.64</td>
</tr>
<tr>
<td>Perceived implicit DI</td>
<td>0.50–0.62</td>
<td>2.23</td>
<td>55.62</td>
<td>0.74</td>
</tr>
<tr>
<td>Technology component</td>
<td>0.76</td>
<td>1.53</td>
<td>76.37</td>
<td>0.50</td>
</tr>
<tr>
<td>Attitude towards DIM</td>
<td>0.55–0.64</td>
<td>1.82</td>
<td>60.49</td>
<td>0.66</td>
</tr>
<tr>
<td>Trust in DIM</td>
<td>0.68–0.75</td>
<td>2.16</td>
<td>71.99</td>
<td>0.71</td>
</tr>
<tr>
<td>Satisfaction with VTCs</td>
<td>0.59–0.76</td>
<td>2.04</td>
<td>67.85</td>
<td>0.66</td>
</tr>
</tbody>
</table>
Table 4
Perception of DIM in VTC: PCA Results

<table>
<thead>
<tr>
<th>Item No.</th>
<th>Construct</th>
<th>Factor 1</th>
<th>Factor 2</th>
<th>Factor 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Perceived explicit DI</td>
<td>0.667</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Perceived explicit DI</td>
<td>0.688</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Perceived explicit DI</td>
<td>0.679</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Perceived explicit DI</td>
<td>0.491</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Perceived implicit DI</td>
<td>0.771</td>
<td></td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>Technology component</td>
<td>0.630</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>Perceived implicit DI</td>
<td>0.650</td>
<td></td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>Perceived implicit DI</td>
<td>0.639</td>
<td></td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>Technology component</td>
<td>0.867</td>
<td></td>
<td></td>
</tr>
<tr>
<td>12</td>
<td>Technology component</td>
<td>0.834</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

KMO = 0.8; $\chi^2(45) = 404.345$, $p < 0.0001$; variance explained 58%.

Standardized estimates were reasonable and statistically significant at the 0.05 level. Standardized estimates for the second-order model are shown in Figure 2.

SEM Testing

A SEM process was conducted in order to test the validity of the proposed conceptual model. The initial model produced $\chi^2(151) = 335.916$, $p = 0.000$; GFI = 0.85; AGFI = 0.81; CFI = 0.88; RMSEA = 0.078. The modification indices showed that model fit could be achieved with the removal of items 2 and 13. Moderate model fit was then achieved with $\chi^2(117) = 223.239$, $p = 0.000$; GFI = 0.88; AGFI = 0.84; CFI = 0.90; RMSEA = 0.071. The relationship between perceptions of DIM and satisfaction was not significant at the 0.05 level. All other standardized estimates were reasonable and statistically significant at the 0.05 level. The model had no negative error variance or unreasonable correlations. In this structural model, perception of DIM had positive effect on attitude towards DIM (0.71) and trust in DIM (0.91) which, in turn, had positive effect on satisfaction. Perception of DIM also had a weak direct positive effect on satisfaction (0.18). Both attitude towards and trust in DIM had positive effect on satisfaction with coefficients of 0.42 and 0.41, respectively. The final model with standardized estimations is shown in Figure 3.

Hypothesis Testing

The results of the first- and second-order CFA support H1 with perceived explicit and implicit digital identities being the most important factors (correlations of 0.99 and 0.79, respectively). Correlation between perception of DIM and technology system implemented in VTC constructs is relatively low (0.34). The statistically significant path coefficient in the final structural equation model (Fig. 3) from perception of DIM to attitude (0.71) indicates strong support for H2. The path coefficient between attitude and satisfaction (0.42) is moderately high, which gives moderate support for H5. Therefore, perception of the overall DIM performance fosters positive attitudes toward DIM and further increases members’ level of satisfaction with DIM services. Statistically significant parameter estimates were found in the two relationships indicated in H3 and H6. The path coefficient in the final structural equation model (Fig. 3) between perception and trust (0.91) indicates strong support for H3. The path coefficient between trust and satisfaction (0.41) is moderately high, which gives moderate support for H6. Thus, perception of the overall DIM performance influences trust in DIM and further increases members’ level of satisfaction with DIM services. With regard to H4, in the final structural model, the relationship between perception of DIM and satisfaction was found not statistically significant ($p$-value = 0.5667), and the correlation between these two was low (0.18). Thus, H4 was not accepted.

Conclusion

Virtual communities are expected to be one of the most effective business models in the information age (Hagel & Armstrong, 1997; Kozinets, 1998; Rothaermel & Sugiyama, 2001), and their rise in online networks has provided great opportunities for the travel industry and its customers. People are drawn to virtual communities because they provide an engaging environment in which to connect with other people for various purposes. By designing and managing VTCs with customer satisfaction in mind, travel companies and organizations can increase consumption of travel products and services, reduce marketing costs, dissemi-
nate information, retain customers, and develop new markets (Buhalis, 1998).

The study indicated that end users’ perception of DIM system employed in VTC was composed of three factors: perceived explicit and implicit digital identities and technology component implemented in VTC, with the first two being the major factors, as indicated by H1 test results. Technology solution did not come through as an important factor in end users’ overall perception of DIM quality, meaning that people participating in VTCs pay more attention to the digital representations of members they interact with than that of the technology features/interface used in the VTCs. A sense of the community can be achieved by observing other members’ profile information, reading their posts, asking questions, and receiving answers. On the other hand, the performance of the technology implemented in the community is relatively difficult to evaluate, and often people tend to accept it at face value. Additionally, the relatively weak relationship between technology component and the overall perception of DIM in VTC might be indicative of other factors influencing end users’ perception of DIM that were not conceptualized in this model, or the deficiencies of the measurement scale employed.

It should also be noted that although in the CFA technology component was not highly correlated with end users’ overall perception of DIM, its estimated coefficient in the final structural model was relatively high (0.71), meaning that technology component has a positive influence on overall satisfaction. The influence of technology component on the overall perception of DIM system employed in VTC needs further study in such contexts where DIM systems are more advanced and comparable across studied communities. As

Figure 2. Second-order CFA solutions for perception of DIM.
follows from results of H1 testing, development of effective methods for explicit and implicit identity management (e.g., identities should be registered to particular users and kept stable across time, a record of past actions and contributions should be kept) is an important task of VTC owners.

The results of this study also demonstrate that end users’ perception of DIM system employed in VTCs positively influences their satisfaction through the mediation of attitude and trust and not directly, because H4 was not supported. Similar results were obtained by Stepchenkova and Mills (2007), whose study sample included a wide range of online community types. One of possible explanations of this result could be that when end users decide to participate in a VTC, they first browse information or “lurk” through the community to get a feeling of the “sense of place.” By doing this, a member would develop some level of psychological and social responses, like trust and attitude, based on their perception of the community. In turn, these responses are then directly linked to members’ level of satisfaction. Another consideration is that communications in VTCs are based mostly on information exchange related to travel and contain little of financial or emotional risks for members. The former is associated with buying–selling transactions that typically are not a VTC feature, and the latter is significantly higher in dating communities. It can be hypothesized that due to this low risk environment of VTCs and, therefore, low financial and emotional involvement, the direct relationship between overall DIM quality and satisfaction was not significant in this study.

By looking at the strengths of the relationships between attitude and satisfaction, and trust and satisfaction, two issues should be highlighted as the guidelines for VTC building and development: creation of trust and increasing positive attitude towards DIM. Community managers should examine how online communication can be facilitated to foster trust within the communities. For example, it might be useful to appoint trustworthy moderators who would lightly review communications before posting or assign to every member some kind of “trust” rating based on how helpful the information provided by this member was to other

Figure 3. Model of DIM and satisfaction with: final SEM solution.
people, very much like it is done in trading communities. Virtual community developers should also focus on developing social and technological mechanism in the communities to increase positive attitude towards DIM. For example, community managers should make technologies accessible and easy to use to a wide range of users on a variety of devices, and at the same time make certain that the software supports effective social interaction online.

There are two important research aspects that have to be taken into account when interpreting the results of this study. First, modern virtual communities are complex environments which incorporate various advanced technology features, so that novice Internet and/or virtual community users might get frustrated and report a low level of satisfaction with VTC. In this study, the level of technology competence was assessed by only one variable, Internet usage (number of hours per week a respondent spends using the Internet). Such information as when a person started using the Internet, how many communities he is a member of, or how long he has been a member of the VTC was not collected in the survey. It is one of the possible venues for future research to examine a relationship between the level of end users’ technology competence and their satisfaction with VTCs. Second, as was mentioned earlier, communications in VTCs are based mostly on information exchange related to travel between members and contain little of financial or emotional risks. Virtual community types with higher levels of personal risks (e.g., dating or buy–sell communities) should be considered to retest H4. Finally, future research should also consider more sophisticated measures of model constructs, particularly factors that contribute to understanding of DIM: perceived explicit and implicit digital identities and technology system implemented in virtual community.

In closing, the information obtained as a result of this study is useful to technology designers who are working on the creation of successful DIM systems for end users in virtual communities. This study also provides valuable information for travel organizations and companies that are considering use of VTCs as one of their marketing strategies. This study contributes to the understanding of VTCs by proposing and empirically testing a conceptual model of end users’ perception of, attitude towards, trust in, and satisfaction with DIM in VTCs. Further investigation into the complex process of satisfaction with overall DIM quality in virtual communities will be beneficial for better understanding of needs and concerns of virtual community members and ultimately assists in perfecting business models of e-marketing and e-commerce.

Acknowledgment

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Biographical Notes

Hua Jiang received a master’s degree in Hospitality and Tourism Management from Purdue University. Her research, supported by the National Science Foundation, investigated end users’ perceptions of digital identity management systems in virtual communities and their influence on users’ satisfaction with online experience drawing on relevant studies from psychology, marketing, and consumer behavior.

Juline E. Mills received a master’s degree in Computer Education & Cognitive Systems and Hospitality Management from the University of North Texas and a Ph.D. in Hospitality and Tourism Management with E-business concentration from Purdue University. She is currently an assistant professor at Purdue University, and her areas of expertise include online consumer behavior, e-satisfaction, e-marketing, electronic surveying methodologies, website usability testing, online legal and ethical issues, and cyber trust.

Svetlana Stepchenkova received a master’s degree in Hospitality and Tourism Management from Purdue University where she is currently a Ph.D. student. She studies destination competitiveness from qualitative and quantitative perspectives, as well as applications of information technologies in travel and tourism, particularly virtual travel communities and destination websites, as a means of obtaining a competitive advantage in destination marketing and management.

References


