

WHY DO PEOPLE ENGAGE IN SOCIAL COMPUTING?
A NEED FULLFILLMENT PERSPECTIVE

By

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ABSTRACT

WHY DO PEOPLE ENGAGE IN SOCIAL COMPUTING?

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With the trend towards social interaction over the Internet and the popularity of websites such as Myspace, Facebook and Youtube among others, practitioners and researchers are motivated to explain the sudden surge in user interest, in a phenomenon that we term, Social Computing. We seek to research the question: “Why do people engage in Social Computing?” The motivation is to determine some of the underlying human psychological factors that are driving this phenomenon. Towards this end, we propose a reformulation of the interactivity construct by suggesting new dimensions of interactivity that are unique to social computing. With this reformulated interactivity

construct, we conduct an exploratory study using the need fulfillment lens provided by the Self Determination Theory. We assess if interactivity, in its richer formulation, influences need fulfillment, which in turn leads to higher levels of self-determined motivation. We also evaluate the impact of the latter on intentions for continued use and actual use of these websites. The results largely support the hypothesized model.

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CHAPTER 1

INTRODUCTION

1.1 Objective

The objective of this research is to investigate the reasons behind the explosive increase in social computing, a term that refers to the use of a technology based medium to interact with other entities, human or not. The dependent variable of interest is the continued use of the software, by the focal individual user.

We propose to investigate this phenomenon and propose a three essay structure for this thesis. In the next section we justify the relevance of our research question. We then explain our decision to investigate this phenomenon from an individual psychological perspective. We give an overview of the three essays and finally discuss the contributions of this thesis.

1.2 The Need for a New Approach

Since system adoption and use is an established dependent variable in IS research (Straub et al. 1995, Davis 1989, Davis et al. 1989), the literature on IS acceptance and success could shed some light on this phenomenon. However, they have some limitations. IS research has traditionally focused on the organizational context and thus the emphasis is on utilitarian use in contexts where the user has little control over the adoption decision. In contrast, the context of social software usage is often

volitional and hedonistic. Further, most of the technology acceptance research has focused on the cognitive aspects of IS use, employing variables such as perceived usefulness and perceived ease of use(Davis 1989). While there has been some research to elucidate the antecedents of these constructs (Venkatesh 2000) and specifically to look at systems outside the organizational context(Venkatesh and Brown 1998), there is limited research on the psychological processes that go on inside the individual with regard to IS adoption and use. This research aims to fill these two gaps.

1.3 Overview of the Three Essays

In the first essay we propose a redefinition of the interactivity construct and justify its salience as an important independent variable to study in line with our objectives above. We define the dimensions of interactivity or Social Computing Interactivity(SCI) as we label it and justify our additions to the dimensions popular in extant literature. We expect this theoretical justification of a new construct to provide a clear and strong foundation for future research in social computing. This also lays the ground for our second essay.

In the second essay, we consider the impact of these dimensions of interactivity on continued use of the social computing websites. We empirically examine the role of individual need fulfillment and its impact on motivation, which is hypothesized to mediate the relationship between interactivity and continued use.

The third essay discusses the results of the empirical research and provides guidance to practitioners on the dimensions of interactivity to keep in mind while designing social software.

1.4 Contributions of this Thesis

- a). This research will provide direction on the reasons for the increase in social computing, a very timely and relevant question, that is of interest to academics and practitioners alike.
- b). The extension of the interactivity construct to address the phenomenon of social computing, as well as the development of the items to measure the construct, will provide a strong foundation for further research.
- c). The results from our empirical investigation should yield insights into the relationship between interactivity and motivations, and how the latter might affect the continued use of social software. A clarification of such relationships will provide practitioners with guidelines on design for greater interactivity and hence greater user loyalty.
- d). This research will be an important validation of the Self Determination Theory in the social computing context, and as far as we know, the first such study to validate the integrated model suggested by Vallerand (1997) in IS contexts.

CHAPTER 2

SOCIAL COMPUTING INTERACTIVITY

2.1 Introduction

The recent explosion in the individual use of websites such as MySpace, Facebook, YouTube and others, has generated a lot of buzz in the media. This buzz has not been without valid reason, as is evidenced by the amount of traffic these sites draw and the valuation being assigned to these companies. It is puzzling that there are no significant revenue streams to justify those valuations (e.g., Google acquisition of YouTube for \$1.6 billion and Microsoft's investment of \$240 million in Facebook). The number of users visiting these sites as well as the growth rate exhibited by such websites is staggering (see Table 2.1).

Given the extraordinary success of these sites, it behooves us to address the following questions:

- a. What is the motivation for users to participate in social computing?
- b. What will it take for these sites to retain existing users and attract new ones?

However, before we attempt to answer these questions, it is pertinent to define social computing and have some sense of how popular it is

Table 2.1 Usage and Growth of Some Social Websites

Website	Unique U.S. users (Sept.2007, Millions)	Growth from previous year (percent)
MySpace	68.1	23
Facebook	30.6	129
Flickr	13.1	90
Bebo	4.4	83
Imeem	3.2	1,590

Source: Businessweek, November 5, 2007 (page 24)

2.1.1 Social Computing

According to Schuler (1994), social computing refers to any type of computing where software serves as an intermediary for a social relation. However, his conceptualization is very broad and he includes in it the instance when the government devises policies involving software development. A good definition from the IBM Social Computing Group (IBM n.d.) is given below.

“Social computing refers to systems which support the gathering, representation, processing and dissemination of social information, that is, information which is distributed across social collectivities such as teams, communities, organizations, cohorts and markets.”

We define social computing as computing where the user takes an active role in the process, often creating content or modifying the computing environment, and the computing experience extends from the individual to the social. In order to make our

conceptualizations relevant, we limit the scope of our analysis to websites, and exclude applications such as e-mail and independent instant messaging applications. We expect our research to extend to mobile computing too, since the distinctions between the computer and the phone are becoming hazy.

2.1.2 Current Trends

According to a recent report by Forrester Research (Li 2007), 48% of US adult online consumers participate in activities such as publishing blogs/webpages, uploading video to YouTube and other sites, commenting on blogs, posting reviews, using social networking sites, or simply consuming user generated content. This increase in interest in social computing is supported with some web traffic statistics. According to a February 2007 report from Hitwise (Prescott 2007), the top twenty social networking websites accounted for 4.9% of Internet Traffic in September 2006, a growth of 96% over September 2005. YouTube.com was the 26th most popular website on the internet in September 2006 (Prescott 2007). YouTube traffic alone comprises approximately 20% of all HTTP traffic, or nearly 10% of all bandwidth usage on the Internet (Ellacoya Networks 2007). While the traffic statistics above indicate a high level of user activity, there are few sites, if any, that have a viable business model. However, because many of these websites are not very capital intensive until they reach a certain scale of traffic, there is a mushrooming of clones of popular sites such as MySpace and YouTube.

Given the statistics above, it is important to find out the reason behind this tremendous increase in use of these websites. Based on our review of literature in Human Computer Interaction (HCI) and Computer Mediated Communication (CMC),

we propose that interactivity, with our suggested extensions, is an appropriate concept to study in an effort to shed light on the success of these websites. Interactivity has been conceptualized in many different ways depending on the perspective taken by the researchers and the context involved. We propose a redefinition of the interactivity construct and justify its salience as an important independent variable to study in line with our objectives above. We define the dimensions of interactivity or social computing interactivity (SCI), as we label it, and justify our additions to the dimensions popular in extant literature.

2.1.3 Contributions of this Research

This conceptualization of interactivity will provide a theoretical grounding for further investigations into the likely impact of interactivity on user behavior on social websites or while interacting with social software. It will provide a platform from which we propose to conduct empirical investigations toward answering an important question about the role interactivity can play in explaining the unprecedented success of social computing. While we will not evaluate the psychometrics of the dimensions of interactivity proposed in this article, we will provide an evaluation of extant literature on the existing operationalizations and provide guidance on their adaptation for social interactivity.

The rest of the article is structured as follows. First we review the importance of interactivity as a predictor variable in several contexts. Then we review the extant literature on different perspectives on interactivity, focusing primarily on the CMC literature as it is the most appropriate foundation for our work. Our research is also

informed by relevant studies in psychology, sociology and human-computer interaction (HCI). We highlight the need for extension of the concept and define the dimensions of SCI and suggest adaptations to existing definitions. Finally, we provide guidance on operationalizing the constructs and suggest directions for a richer theoretical exploration of social computing.

2.2 Background

Interactivity has been an important construct in several fields of research such as marketing, communication, human computer interaction (HCI) and computer mediated communication (CMC). Given this diverse theoretical background there have been several competing and complementary conceptualizations of interactivity. While the concept of interactivity has attracted a fair share of attention, the disparate literature on interactivity has also been the subject of much discussion (Downes and McMillan 2000, Yadav and Varadarajan 2005, Kioussis 2002). We review this literature to establish the importance of interactivity as an IV and create a foundation for the redefinition of the concept in the context of social computing.

In a study on interactive advertisements, Cho and Leckenby (1999) found that the level of perceived interactivity was positively associated with attitude toward the product as well as with the intention to purchase. Wu (1999) found that perceived interactivity was positively associated with the user's attitudes towards the website. Likewise, Teo et al. (2003) found that increased level of interactivity on a website has positive effects on users' perceived satisfaction, effectiveness, efficiency, value, and overall attitude towards the website. Ghose and Dou (1998) found that greater

interactivity is associated with Internet presence sites being counted as ‘top sites’. Other research has considered the relationship of interactivity to choice difficulty (Ariely 2000), online navigation experience (McMillan and Hwang 2002; Novak et al. 2000), and processing of online advertisements (Liu and Shrum 2002; Stewart and Pavlou 2002). This representative review indicates the importance of the business to customer (B2C) aspect of communication in which the literature is based. However, this line of research ignores the current trend in social websites, where the emphasis is on user-user interaction, rather than just user-medium interaction or user-firm interaction. Since the central concern in the field of computer mediated communication (CMC) is the mediated enablement of user-user interaction, we anchor our research in the rich body of literature in that field.

Early research in CMC indicated that it was low in social presence, which was defined as the user's perception of the ability of the means of communication to marshal and focus the presence of communicating subjects (Short et al. 1976). This observation was consistent with the ‘cues filtered out’ perspective (Culnan and Markus 1987), as well as with the views on media richness (Daft and Lengel 1986) and limited social cues (Kiesler et al 1984). However, this notion has been contradicted in research that builds on the foundations of the social information processing view (Walther 1992). The central theme of the latter perspective is that the level or richness of communication enabled by a medium may be contingent on other factors, such as the time spent in the interaction or the expectation of future interaction. The findings of some research studies contradict the results from early experiments in the ‘cues filtered out’ tradition,

suggesting that CMC may enable more effective interpersonal interactions because of the ability to optimize self-presentation (Walther 1996).

With the technologies available today on the web, CMC has moved beyond the realm of the ‘text’ interface. The increased level of interactivity afforded by these technologies requires a deeper level of analysis as well as a redefinition of the notion of interactivity to make it germane to the context of social computing. We examine the various perspectives on interactivity below and then propose our redefinition.

2.2.1 Perspectives on Interactivity

Interactivity has been conceptualized in many different ways depending on the perspective taken by the researchers and the context involved. Kiouisis (2002) provides an excellent review of the disparate conceptualizations of interactivity and conflicting results in extant research. For example, they mention that the operationalization of levels of interactivity as a function of the technological features (Schneiderman 1992) is in stark contrast to its operationalization as a perceptual report from the users (Newhagen et al 1995). Kiouisis (2002) posits that interactivity has been defined with regard to technological properties, communication context, and user perceptions of interactivity. In addition to providing an excellent review of the multiple definitions of interactivity, Kiouisis (2002) provides his own, which we quote below:

“Interactivity can be defined as the degree to which a communication technology can create a mediated environment in which participants can communicate (one-to-one, one-to-many, and many-to-many), both synchronously and asynchronously, and participate in reciprocal message exchanges (third-order dependency). With regard to

human users, it additionally refers to their ability to perceive the experience as a simulation of interpersonal communication and increase their awareness of telepresence.”(pp. 372)

Yet another context-specific definition of interactivity for electronic marketplaces, proposed by Yadav and Varadarajan (2005), reads as follows:

“Interactivity in the electronic marketplace is the degree to which computer mediated communication is perceived by each of the communicating entities to be (a) bidirectional, (b) timely, (c) mutually controllable, and (d) responsive”(pp.593)

Both definitions above propose a composite definition of interactivity based on the underlying dimensions identified by the authors. The definition by Yadav and Varadarajan (2005) is very appropriate for an extension to our context of social computing. A detailed review of the empirical work on interactivity, including several excellent meta analyses of the concept (McMillan and Hwang 2002, Tremayne 2005, Kioussis 2002), suggests three dominant perspectives: a) Interactivity as the users’ perception; b) as a function of the properties of the medium, and c) as a process of message exchange or interaction with the message/medium. For the sake of brevity, only an overview of the conceptualizations is presented here.

2.2.1.1 Interactivity as a Perception

This perspective was not dominant until quite recently. Earlier conceptualizations focused on interactivity as properties of the medium or technology features. However, with empirical work showing that individual perception of the features was more important than the presence of the features themselves, this approach

has gained ground (Kiousis 1999, McMillan 2000, McMillan and Hwang 2002, Wu 1999). These perceptions were measured on different operationalizations of interactivity, such as control (Steuer 1992), interpersonal communication (Kiousis 1999), awareness of telepresence (Kiousis 1999), and responsiveness (Wu 1999).

2.2.1.2 Interactivity as Properties of the Medium or Technology

The traditional thinking on interactivity promoted it as a function of the features of the medium, sometimes as a gradient, with more features implying more interactivity. Prominent among them were Ha and James (1998) who identified five characteristics of interactivity and Novak et al. (2000) who focused on time required for interaction. Ghose and Dou (1998) listed 23 site characteristics and evaluated which ones were most often found in a sample of 'Internet Presence Sites' and related them to a site being classified as a 'top site' in the rankings from Lycos, a search engine. McMillan (1999) used site features as indicators of interactivity, using the 5 dimensions proposed by Heeter (1989). Clearly, the results/findings of these studies suggest a multidimensional conceptualization of interactivity.

2.2.1.3 Interactivity as message exchange or interaction with message/medium

The classical definition of interactivity which is most cited in literature in communication was proposed by Rafaeli (1988). According to him

“Interactivity is an expression of the extent that in a given series of communication exchanges, any third (or later) transmission (or message) is related to the degree to which previous exchanges referred to even earlier transmissions” (p.111).

This definition completely ignores the technological factors included in earlier conceptualizations. Here the focus is on the exchange of messages and that the messages in a sequence should relate to each other. Another prominently cited definition was proposed by Williams et al. (1988)

“the degree to which participants in a communication process have control over, and can exchange roles in, their mutual discourse” (pp. 10)

Cho and Leckenby(1999) measured interactivity as the process of interaction with an advertisement.

2.3 Social Computing Interactivity

As the literature review above indicates, interactivity is a multi-dimensional construct. It has been studied as a media characteristic, as a perceptual variable, and as a process of message exchange (Tremayne 2005). In consonance with current research (Wu 1999, Sohn & Lee 2005), we conceptualize Social Computing Interactivity (SCI) as a perceived measure with multiple dimensions. Further, rather than restricting the definition to a particular kind or group of software, we keep the definition independent of technology, but relevant to the context of social software use, which is the domain of interest in our study.

Since many conceptualizations of interactivity propose dimensions of control, responsiveness and reciprocal communication, we consider these three dimensions the core dimensions of interactivity and retain them in our redefinition of the concept. However, we argue that the ‘social’ aspect of the social computing phenomenon is not addressed by these dimensions. We propose three other dimensions, social presence,

self-presentation and deep profiling motivated by the research by Ma and Agarwal (2007). These constructs were originally proposed in the context of participation in online communities. The authors highlight the importance of identity communication and subsequent verification in traditional non-mediated interaction and extend this argument to online community participation. They discuss technology artifacts, the use of which promotes identity verification. We adapt these for our context, and opine that the issue of identity communication is salient even for individual users engaged in social computing (not necessarily in a group or a community). Furthermore, since the dimensions of identity communication and verification have been shown to be a prerequisite for effective interaction (Ma and Agarwal, 2007), it seems appropriate to include them in our definition of interactivity.

In keeping with the definitions reviewed above, we propose our definition of interactivity. *“Interactivity, in the context of websites where the computing experience extends from the individual to the social, is the degree to which the website is perceived to: a) enable control; b) exhibit responsiveness; c) enable reciprocal communication, both user-medium and user-us; d)enable social presence; and e) provide capabilities for self-presentation and deep profiling”.*

As argued correctly by Sohn and Lee (2005), the dimensions of perceived interactivity should not be integrated into one score, since that dilutes the investigation into the differential impacts of these individual dimensions. So, instead of determining a single composite score and evaluating a medium for levels of interactivity on a gradient, we suggest that these dimensions should be independently measured before their

relationships with suitable outcome variables are studied. We define the dimensions below:

2.3.1 Control

The literature review above highlighted a formulation of interactivity as the degree of control afforded by the medium. This has been conceptualized in several ways:

1. Control over navigability, content or pace (Sohn and Lee 2005).
2. ‘The extent to which users can participate in modifying the form and content of a mediated environment in real-time’ (Steuer 1992 pp.84). Though this is the definition of interactivity, it is referring to the users’ control over the form and content of the medium.
3. Control over the communication process (Yadav and Varadrajana 2005).
4. “the degree to which participants in a communication process have control over, and can exchange roles in, their mutual discourse is called interactivity” (Williams et al. 1988, pp. 10).

Since we propose to conceptualize the dimensions as perceptions and keep them independent of the characteristics of the medium, the definition proposed by Steuer (1992) is used as the basis. He conceptualized three dimensions of interactivity, namely, speed, range, and mapping. Here the concept of range is most pertinent for our needs. We quote the definition here

“The range of interactivity is determined by the number of attributes of the mediated environment that can be manipulated, and the amount of variation possible within each attribute” (pp. 86)

When considered from the perspective of the number of attributes manipulated, control over the form of some social software, such as a social networking website, would include attributes such as the layout, the content or the colors. The higher the number of attributes that the user can modify, the greater the degree of control. It is important to reiterate that we do not enumerate the attributes that can be modified to get a measure of controllability for the medium; instead, we will rely on the perceptions of the user. Control over the content of such a site would involve content that the users can put in there, the content they that want to see from their friends’ pages, or content from third party services (such as photos, music, stock prices, weather etc) using RSS feeds.

The sources cited above offer alternatives for scale creation for measuring this variable, but we propose that the scale used by Liu and Shrum (2002), with appropriate modifications to capture the ability of the user to control the content, layout, colors and other personalization options.

2.3.2 Responsiveness

This dimension captures the element of time it takes for the medium to respond to user action and the possibility of response as well. The speed of response was central to Steuer’s (1992) definition of interactivity. Coyle and Thorson (2001) also state that quick transitions between a user’s actions and the consequent outcome make a website interactive. Wu(1999) concluded that navigation and responsiveness are two dimensions

to measure interactivity of websites. Liu and Shrum (2002) use a term called “Synchronicity”, which refers to the degree to which a user’s input and its attendant response is simultaneous.

Since social computing is focused on user-generated content, this dimension becomes very important. The users are no longer just browsing casually or doing information search. They are actively interacting with the medium, to change its form or content, and communicating with other users. Besides the speed of response, we also include the probability of response in this definition. Therefore, lower interactivity results if the user interacts with the interface and does not get a response.

For measuring responsiveness, we would again recommend using the scale by Liu and Shrum (2002) as the base and incorporate an item measuring the speed of response when the user is customizing the website to her needs, since that is an important activity on these websites.

2.3.3 Reciprocal Communication

The ability of a medium to provide two-way communication is central to the definition of interactivity. Massey and Levy (1999) opine that providing user’s with communication tools such as chat rooms and bulletin boards enable “interpersonal interactivity”. According to Heeter (1989), facilitation of interpersonal communication is one of the dimensions of interactivity. McMillan (2002) uses the dimensions of control and direction of communication to identify four different types of interactivity.

We conceptualize reciprocal communication as the enablement of user-to-user and user to website communication. User to user communication could be one to one,

one to many and many to many. This may be explicit in the form of Blog posts and comments (one to many), chat rooms (one to many), bulletin boards (one to many), instant messaging, notes on a friends 'wall' on Facebook (one to one and one to many), etc. It could also be more implicit in terms of providing feedback to other users such as ratings on user content, such as the model in Digg.com or rating a user's video uploaded on Youtube.com. User to website communication would be enabled by providing easy options to provide feedback on the site content or features to the site administrators. Many of these websites develop features iteratively based on user feedback. If the site administrators make it evident that they are accepting feedback and making changes, users are likely to rate the website higher on reciprocal communication.

Since the construct is tapping two dimensions of user to user and user to website communications and the resulting construct is a result of the rating of the website on these two dimensions, we propose that this construct should be operationalized as a formative construct. For items measuring the user to website communication capability, Liu and Shrum(2002) would be an appropriate source and we recommend development of new items to measure the user to user communication capability.

2.3.4 Social Presence

This construct along with the next two, self-presentation and deep profiling, have been adapted from Ma and Agarwal (2007) along with suitable modifications to make them relevant to our context. As mentioned earlier, Short et al. (1976) define social presence of a medium as the user's perception of the ability of the means of communication to marshal and focus the presence of communicating subjects. They

define this as a subjective quality of the medium, with varying levels in different communication media. These levels are based on the ability of the media to transmit information about facial expression, direction of looking, and nonverbal cues. However, this perspective is based on the assumption that the benchmark for CMC is traditional face-to-face communication and thus CMC has been considered low in social presence (Short et al. 1976). Walther (1992) countered this argument and proposed the social information processing viewpoint, where he proposed that the level of presence afforded by a media cannot be measured using the features of the medium. Instead, the perception of the users dictates the level of presence. He also reviews literature which contradicts the 'low social presence' view of CMC and says that presence may be a function of the context, user characteristics, and purpose of use of the media as well. For a detailed discussion of the varied conceptualizations of presence, the reader is referred to Gunawardena (1995) and Biocca et al. (2003).

A more relevant and contextual definition was proposed by Ma and Agarwal (2007) for a construct called virtual co-presence. Building on the conceptualization by Biocca et al. (2003), they defined it as the feeling of being together in a virtual environment in the context of users in an online community. According to Biocca et al. (2003), these 'others' whose co-presence is of interest to the user are "primarily technologically mediated representations of other humans or forms of intelligence including mediated representations of remote humans via text, images, video, 3D avatars..." (pp.456-457).

So this presence could be human or artificial. The definition used by Ma and Agarwal (2007) considers interactivity, speed of interaction, and vividness as factors that enable perceptions of virtual co-presence. Since we are conceptualizing social presence as a dimension of interactivity we need to avoid this broad definition. We want to capture the ability of the medium to simulate co-presence, in terms of sensory awareness of the other (Goffman 1959), and the perception that the others react to the focal user (Heeter 1992). Hence, we define social presence as the degree to which users perceive the physical existence of others and the perception of the extent of interaction with the other user(s).

Since this construct taps into two dimensions, we propose that this construct should be formative. Diamantopoulos and Winklhofer (2001) proposed guidelines regarding the creation and validation of formative indicators, which is appropriate for this construct and other formative constructs we propose. Though the items created by Ma and Agarwal (2007) for these constructs followed these guidelines, the context for their research was a user's knowledge contribution in two specific online communities. In our context, the role of these constructs in influencing the perception of relatedness with other users is most important and hence we recommend a modification of the items accordingly.

2.3.5 Self Presentation

Ma and Agarwal (2007, pp. 50) propose this construct and define it as “a process to communicate one's identity, helping others form a more sophisticated and accurate understanding of “Who am I?”. According to them, self-presentation can be

achieved through the use of signatures, screen names, avatars (virtual representations, sometimes animated), personal profiles, and web pages or personal photographs, among others. The authors discuss the psychological processes involved in non technology-mediated interactions from the perspective of Attribution theory, which contends that people use available social information to judge the personality and identity of others. This communication of identity is a first step in any new interaction (Goffman 1967). Since people with shared interests or tastes are more likely to communicate and build relationships (Newcomb 1961), identity communication will enable discovery of such people. Though the authors use this construct in the context of online community members, we propose that this conceptualization is equally valid for an individual user using social websites, even if it is not a formal online community. Ma and Agarwal (2007) formulate this as a formative construct and we propose the same and recommend the items used by them as suitable for our context, with minor modifications.

2.3.6 Deep Profiling

Ma and Agarwal (2007) contend that availability of artifacts such as rankings, feedback, detailed archives of user contributions, and ‘Who did what’ features are examples of deep profiling artifacts. Deep profiling, along with the earlier two dimensions of social presence and self-presentation, enables efficient identity communication. These artifacts provide a context which assists in reducing attribution differences arising due to the rarity of cues afforded by CMC. In contrast to self-presentation, where it is the initiative of the user to use the features for self-presentation, deep profiling features are more under the control of the system, often dependent on the

use of such features (e.g., feedback mechanisms) by other users. Since these mechanisms allow for users to evaluate other users and form perceptions, they are a prerequisite for effective interaction. Hence, we include deep profiling as another dimension of interactivity.

In addition to self-presentation and social presence, we also conceptualize deep profiling as a formative construct, rather than reflective as was done by Ma and Agarwal (2007). In the original study the items were measuring a user's perceptions of what information about her was being viewed/considered by the other users while interacting with her. In our context, the perspective is about the ease of finding information about another user who is the subject of a possible interaction. Hence the language of all the items needs to be modified. For example, instead of the item "I think that other people have read my previous posts", we would recommend an item "I can easily read the earlier posts of other users".

2.4 Future Research

In the discussion above, we have proposed three new dimensions of interactivity to represent the richer and more complex social software that we see today. In order to confirm these dimensions of interactivity, we call for exploratory research to develop and validate scales for the dimensions and to study the impact of the various dimensions of SCI on the use of social computing websites. While there are several theoretical lenses that could be used to illuminate the relationship between SCI dimensions and use of these websites, we mention only some of the relevant theory bases here.

One prominent theory in the communication and advertising literature is the Use and Gratifications perspective. This perspective focused on the psychological orientation of the receiver/user of the communication and thus proposed an alternative to the predominant emphasis that was placed on the sender and the message in mass communication research until the 1970s. It offers the explanation that people consume different types of media, be it newspapers, television, radio or the internet, because of the gratification they get out of their use. In a review of the literature on the use of this perspective to explain internet use, LaRose and Eastin (2004) found that several studies explained very little variance in internet use. They went on to propose additional constructs based on social cognitive theory (Bandura 1986) to better explain internet usage. This theory base seems very appropriate to investigate the impact of the interactivity dimensions on gratifications obtained, which in turn may help explain social computing usage.

On a related note, there is a well developed theory or rather a collection of mini-theories in psychology called the Self Determination Theory (SDT) that was proposed by Deci and Ryan (1985, 2000). This set of theories examines the concepts of intrinsic and extrinsic motivation, the effects of social contexts or environmental factors on intrinsic motivation, and the concept of basic psychological needs and their relationship to psychological health and well-being. They propose that all humans have some basic psychological needs - autonomy, competence and relatedness - and fulfillment of these needs is positively associated with higher levels of self-determined motivation, which subsequently leads to persistent behavior. If the dimensions of interactivity are

considered to be the factors that the users are exposed to while using a particular website, then these dimensions could be hypothesized to fulfill certain needs. For example, a greater ability for self-presentation on the website might be associated with a higher level of relatedness perception, where relatedness is defined as the desire to feel connected to significant others.

We call on researchers to create inroads into this domain by adopting a multi-disciplinary approach, as we have attempted to do in this article.

2.5 Conclusions

In this article, we reviewed the importance of interactivity and proposed it as an important research construct in the context of social computing. We highlighted the major conceptualizations of interactivity and discussed the rationale for its redefinition. This traditional definition of interactivity is extended by adding three new dimensions, thus evolving a six-dimensional view of interactivity that is likely to be more useful in understanding issues pertaining to social computing. Further, we provided direction on operationalizing the constructs. Finally, the discussion on the appropriate theoretical lenses to advance this research provides some guidance to other researchers. The validation of this multi-dimensional model of interactivity relevant for the social computing domain as well as the development of theory-based models investigating the impact of SCI on the use of these websites would provide a useful conceptual platform for pursuing research in this rich and complex area of social computing.

CHAPTER 3

MOTIVATIONS FOR SOCIAL COMPUTING: A SELF DETERMINATION PERSPECTIVE

3.1 Introduction

With the trend towards social interaction over the Internet and the mushrooming of websites in the social computing space, we seek to research the question: “Why do people engage in Social Computing?” The motivation is to clear away the hype generated by the success of websites such as MySpace and YouTube, and identify some underlying human psychological factors that are driving this phenomenon. These websites are attracting huge traffic and the year on year growth of traffic on some of these websites is over a 100% (Businessweek 2007). Contrary to popular belief the usage of these websites is popular across all age groups, and not just the 18-24 demographic. This explosion in use is not restricted to social networking websites or media sharing websites only. This trend can be seen in the use of collaborative bookmarking services such as Del.icio.us or music listening websites which provide tools for sharing music preferences such as Last.fm. Over 48% of US adult online users do some active interaction with websites, such as publishing blogs, posting reviews, uploading videos on Youtube or using social networking websites(Li 2007). In essence,

the use of the internet is increasingly becoming a social experience and users are taking a more active role in shaping the environment, by creating content rather than just consuming. This change in computing experience from the individual to the social, where the user takes an active role, is what we term ‘social computing’.

In order to identify the reasons behind this surge in user interest in social computing, it becomes important to identify the features of these websites which are attracting so many users. The literature in Human Computer Interaction(HCI) and Computer Mediated Communication(CMC) has frequently studied the role of interactivity in the success of websites, among several other dependent variables. We propose that the existing dominant conceptualizations of interactivity, though useful, are not sufficient to investigate this new phenomenon. We propose a reformulation of the interactivity construct, which includes several new dimensions of interactivity that are unique to social computing and label it Social Computing Interactivity (SCI). The objective of this research is to examine the relationship of this redefined construct, SCI, to persistent use of social websites.

In contrast with the predominant research paradigm in IS, which considers the cognitive aspects in IS acceptance and use, we propose to go beyond the ‘black box’ of cognition, into the realm of motivation, using the lens provided by Self Determination Theory (Deci and Ryan 1985, 2000). The cognitive focus of mainstream IT adoption and diffusion studies are relevant for a work context where there is an instrumental purpose for the use of the particular system or implicit coercion for its use. In contrast, social computing is characterized with autonomous use which is often hedonistic. In

such a case, motivation, in its rich multidimensional conceptualization as proposed by Deci and Ryan (1985) is a more fundamental construct to examine.

Self Determination Theory (Deci and Ryan 1985, 2000) is a collection of mini theories dealing with the concepts of intrinsic and extrinsic motivation, the effects of social contexts or environmental factors on intrinsic motivation, and the concept of basic psychological needs and their relationship to psychological health and well-being. The central tenet linking these three theories is that all humans have some basic psychological needs and fulfillment of these needs is positively associated with higher levels of autonomous motivation, which subsequently leads to persistent behavior.

Using this theory base, Vallerand (1997) proposed a motivational sequence, which related environmental factors (or social context) to need fulfillment, which in turn impacts the level of self-determined motivation and leads to behavioral, affective or cognitive consequences. This model has been empirically validated in different life domains such as Education, Sports and Health (see Vallerand 1997 for a complete review). Since the phenomenon under consideration is the continued use of social software, where the use is inherently voluntary in nature, the role of self-determined motivation is very important. Further, we are interested in finding out some persistent individual psychological payoffs which explain the current euphoria over social computing and allow us to explore these payoffs as predictors of continued use of these websites. The conceptualization of three basic and universal needs, the fulfillment of which leads to self-determined motivation is an excellent theoretical lens with which to study the social computing phenomena.

In this research we consider the concept of Social Computing Interactivity (SCI) and conduct an empirical investigation into the sequential relationship of the individual perceptions of the different dimensions of interactivity and need fulfillment and the subsequent impact on motivation. We further study the role of motivation in influencing the intention to continue using the target website and its actual use. The rich theory base built around SDT, allows us to bridge the gap between SCI and the motivations for use of these websites. Our results, based on 225 respondents, indicate support for the integrated model from perceptions of interactivity to actual use of the websites.

3.2 Theoretical Background

3.2.1 Interactivity: A literature Review

Interactivity has been studied extensively in several fields of research such as human computer interaction (HCI), computer mediated communication (CMC), marketing and communication. It has been defined in several different ways depending on the context of the research. It has been associated with several important outcomes such as attitude toward the product and intention to purchase (Cho and Leckenby 1999), user attitudes towards a website (Wu 1999), user satisfaction, effectiveness, efficiency, value and attitude towards a website (Teo et al. 2003). The focus on this research has been on user to interface interaction, while our context requires a focus on user to user interaction. However, early research in CMC, the media richness theory (Daft and Lengel 1986), the ‘cues filtered out perspective’ (Culnan and Markus 1987) would lead us to believe that CMC was low in social presence or richness of the message, and thus not the best choice for user to user interaction. However, according to Walther (1992),

the effectiveness of CMC to enable user to user interaction is moderated by several contextual factors such as the time spent in the interaction or the expectation of future interactions, and suggests that CMC allows the users to optimize their self-presentation, thus making it a more efficient method of communication.

Interactivity has been conceptualized in different ways depending on the context of the research and the field of research in which it is based. There are several excellent meta analyses of the concept (McMillan and Hwang 2002, Tremayne 2005, Kiousis 2002), and they highlight three dominant perspectives: a) Interactivity as the users perception; b) as a function of the properties of the medium, and c) as a process of message exchange or interaction with the message/medium.

Earlier conceptualizations of interactivity focused on it as a function of the properties of the medium, prominent among them being the responsiveness of the website, the amount of control over the website, and the ability for interpersonal communication (HA and James 1998; Ghose and Dou 1998, Novak et al. 2000, McMillan 1999, Heeter 1989). As research about this construct matured, researchers found that user perceptions about these features was a more effective predictor in several cases and as a result this view has become the dominant perspective now(Kiousis 1999, McMillan 2000, McMillan and Hwang 2002). Finally, the third perspective on interactivity, championed by Rafaeli(1988) and Williams(1988), considered interactivity as a characteristic of a message exchange, or the communication process. These different conceptualizations suggest a multidimensional view of interactivity. For our context, interactivity as a perception is the most

appropriate foundation and we build upon the dominant dimensions of interactivity to propose a revised formulation for social computing labeled SCI.

3.2.2 Social Computing Interactivity

We extend the current formulation of interactivity as a perceptual measure and build on the three key dimensions of control, responsiveness and communication, to propose three additional dimensions, social presence, self-presentation and deep profiling motivated by the research by Ma and Agarwal(2007), which are relevant for social computing. We define SCI as *“the degree to which the interaction (user-medium and user-user) is perceived to: a) enable control; b) exhibit responsiveness; c) enable reciprocal communication and social presence; and e) provide capabilities for self-presentation and deep profiling”*.

- a) Control: This has been conceptualized as control over navigability, content or pace (Sonh and Lee 2005). The classic definition by Steuer (1992) considers the extent to which users can modify the form and content of the interface. Yadav and Varadarajan (2005) consider control over the communication process. Since we want to keep our definition independent of the characteristics of the medium, we build on the definition by Steuer (1992) for range, one dimension of interactivity. This refers to the number of attributes that can be manipulated and the amount of variation within each attribute. We build on this to propose that control could involve the user deciding on the content, layout, colors or other personalization options. Control could involve the ability to decide what information a user wants to

see on her profile such as information from their friends' pages, or content from third party services (such as photos, music, stock prices, weather etc) using RSS feeds.

- b) Responsiveness: We define this construct to refer to the time it takes for the website to respond to the user as well as the probability of a response. This construct was important in the definition of interactivity proposed by Steuer (1992) and others (Wu 1999, Coyle and Thorston 2001). Since the role of the user in our context changes from being a content consumer to a content producer, responsiveness of the website becomes critical. Further, we also emphasize the probability of response as part of our definition. If the user gets fast response from the website usually, but in some cases, there is no response, there is a lack of feedback to the user, thus making the site less interactive.
- c) Reciprocal Communication: This refers to the ability of the website to enable communication among users and between the user and the website. This has been central to earlier definitions of interactivity (Massey and Levy 1999, Heeter 1989, McMillan 2002). Chat and bulletin boards were the common forms of interpersonal communication available on earlier websites, but now there are several more options available. Now communications take the form of comments on blog posts, comments of the users' profile on networking sites, or simply reading an RSS feed of your friends' daily activities on the site (eg. Facebook.com). Communications

could also be implicit, such as ratings of user videos on Youtube, or news articles on Digg.com. Website features which convey that the users' feedback is important, such as an active employee blog, or prominent feedback links foster the perceptions of user to website communication. Some websites actively solicit user requests for new features on the website and then display when the selected features would be available. This enables user to website communication too.

- d) Social Presence: Social presence, self-presentation and deep profiling are the new constructs we propose for an enhanced definition of interactivity, to make it relevant to social computing. These constructs are based on the constructs proposed by Ma and Agarwal (2007), with suitable modifications. Short et al. (1976) define social presence of a medium as the user's perception of the ability of the means of communication to marshal and focus the presence of communicating subjects. It may be found in different levels in different media and these levels are based on the ability of the media to transmit information about facial expression, direction of looking, and nonverbal cues. Given this definition, it is obvious that when they compare the social presence of CMC to face-to-face communication, CMC comes a distant second. Walther (1992) proposed that the level of presence afforded by a media cannot be measured based on the abilities of the medium. Instead, the perception of the users at a more abstract level dictates the level of presence. He contends that presence may be a function of the

context, user characteristics, and purpose of use of the media as well. Ma and Agarwal (2007), proposed virtual co-presence as the feeling of being together in a virtual environment. This definition was motivated by the work of Biocca et al. (2003), who contend that, these ‘others’ whose co-presence is of interest to the user are “primarily technologically mediated representations of other humans or forms of intelligence including mediated representations of remote humans via text, images, video, 3D avatars...” (pp.456-457). This allows for the ‘other’ to be human or artificial. Ma and Agarwal (2007) include interactivity, speed of interaction and vividness as enablers of virtual co-presence. However, we avoid this broad definition and focus on the sensory awareness of the other (Goffman 1959), as well as the perception that others react to the user (Heeter 1992). We define social presence as the degree to which users perceive the physical existence of others and the perception of the extent of interaction with the other user(s).

- e) Self-presentation: Ma and Agarwal (2007) define this as the process to communicate one’s identity, giving other users more information about oneself. This may be achieved by the use of signatures, screen names, avatars (virtual representations), personal profiles, web pages or personal photographs, among others. According to Goffman (1967), the presentation of identity is a first step in any new interaction. Identity communication will enable people with shared interests to discover each other and such interactions are more likely to develop into relationships (Newcomb 1961).

- f) Deep profiling: According to Ma and Agarwal (2007), deep profiling along with virtual co-presence and self-presentation are important for identity communication. This construct refers to the availability of detailed information about users, which could be in form of archives of posts on the website, rankings, feedback, and ‘who did what’ features. Since these mechanisms allow for users to evaluate other users and form perceptions, they are a prerequisite for effective interaction and we include it as another dimension of interactivity.

The discussion above proposed a revised formulation of interactivity to make it relevant for social computing. We will discuss the operationalization of the constructs later.

3.2.3 Self Determination Theory: A Review

We present an overview of the theory here and suggest that the reader refer to Deci and Ryan (2000) for a comprehensive review of the theory. As mentioned above, the focus of SDT has been the concepts of intrinsic and extrinsic motivation and the relationship of psychological need fulfillment to intrinsic motivation. Instead of looking at intrinsic and extrinsic motivation as two extremes, they propose a continuum from intrinsic motivation to extrinsic motivation to amotivation(lack of motivation). Extrinsic motivation is conceptualized with four levels of regulation: External, Introjected, Identified and Integrated. These depend on the level of internalization of external influences by the focal person. These are further divided into two categories.

a). Controlled Motivation: External regulation and introjected regulation are forms of non self-determined external motivation (Deci and Ryan 1985), where the individual does the activity under force or obligation due to an external reward or to avoid some negative fallout. External regulation is when the behavior is regulated through external rewards or constraints. Introjected regulation is when the individual begins to internalize the external constraints, but still does not really choose that action.

b) Autonomous Motivation: Identified regulation and integrated regulation are forms of self-determined motivation where the individual does the activity out of choice, even though the conditions of an external award or negative fallout may be present. Identified regulation is when the individual judges the task as very important for himself/herself, and does it, even if it is quite unpleasant. A good example would be a child taking an unpleasant tasting medication, because the parents say that it will help him get well. Integrated regulation is the closest to intrinsic motivation, where the individual has internalized the external constraints, or circumstances and the task is now done out of choice, such as not going out with friends before an exam.

Cognitive Evaluation Theory (CET), one of the mini theories under the banner of SDT, proposes that the environment influences motivation through its impact on the individual's perceptions of competence, autonomy, and relatedness, which are fundamental and universal needs. Fulfillment of these needs, or more accurately, a perception of fulfillment of these needs is positively associated with the notion of self-determined motivation that was explained earlier. Fulfillment of these needs is discussed in detail in the next section. Hence, environmental factors which influence

these needs positively will result in higher self-determined motivation and those that result in these needs being thwarted will have a negative effect.

3.2.4 Motivation and Behavior

Given the relationship proposed between environmental factors and motivation, mediated by the three needs, the final piece of the puzzle is the relationship of motivation to consequences. Vallerand (1997 pp.319) while justifying this linkage in the context of their Hierarchical model of motivation, suggests that there is “evidence that motivation actually “causes” consequences...”. He cites the work of Amabile (1985) which presented clear empirical evidence to this end. Motivation has often been related to outcomes in the education context very often, such as school performance and dropouts (e.g., Vallerand, Fortier, & Guay, 1997), and also in the health domain (Pelletier, Fortier, Vallerand, & Bri’ere, 2001; Sarrazin, Vallerand, Guillet, Pelletier, & Cury, 2002). Most of the studies cited earlier are theoretically anchored in SDT. Vallerand (1997) also justifies classification of the consequences into cognitive, affective and behavioral in nature. Of particular interest in Vallerand’s work is the linkage with behavior, since we are concerned with the users’ intention to continue using the focal website. He cites the work of Kruglanski et al. (1971) where motivation was related to behavioral intention. Finally, in accordance with extant literature on the Technology Acceptance Model, we go beyond behavioral intention and measure actual use and evaluate that as the eventual dependent variable in the model.

3.3 Research Model and Hypotheses

As reviewed earlier, Vallerand (1997) proposed a motivational sequence from environmental factors to consequences mediated by need fulfillment and motivation. We redefined interactivity and proposed some additional dimensions leading to the concept of SCI. We consider the role of the dimensions of SCI and examine the users' perceptions of these factors and their impact on the motivational sequence. The research model we propose is shown in Figure 3.1.

3.3.1 Social Computing Interactivity: Its role in need fulfillment

We propose relationships between the perceptions of the dimensions of interactivity and the perceptions of autonomy, competence and relatedness. In our context, control of the form and content of the medium, would mean the ability to modify the layout, colors, presentation etc.; submit content; incorporate content from other sources; and personalize the website. The need for autonomy has been defined as the desire to choose the activities one engages in, (Deci 1975, Deci and Ryan 1985) and to be the origin of one's behavior (deCharms 1968). According to deCharms (1968) an internal perceived locus of control and choice is associated with the feeling of being the origins of one's actions. Zhang and Gisela (2000) find that user empowerment, operationalized as control over navigation and information access, leads to user satisfaction with the website. However, they don't delve into the rationale behind this relationship. We contend that user control will enable the fulfillment of the need for autonomy, which may then explain a lot of the positive attitudinal attributed. Hence we propose the following hypothesis:

Hypothesis 1 (H1). *The perceptions of control while using the site will be positively related to the level of perceived autonomy.*

The feeling of being in control has also been associated with increased self-efficacy beliefs (Gist and Mitchell 1992, Tafarodi, Milne and Smith 1999). Further, lack of control produces stress and lower perceived competency (Judge, Bono and Locke 2000). Rafaeli (1988) opined that when users have a sense of control, this is likely to increase cognitive processing. This leads to the users being able to learn more from the interface and about the interface, thus feeding their need for competence. In the literature on information control on the web, Ariely (2000) posits that if the user can control how the information is presented to her on a website, then this improves performance by improving the fit between actions and outcomes. Therefore, our hypothesis is:

Hypothesis 2 (H2). *The perceptions of control while using the site will be positively related to the level of perceived competence.*

Responsiveness captures the time component of the response from the site, which is critical if the users are submitting content continuously and personalizing their ‘space’ online. A highly responsive site not only provides a response at all times, but also gives immediate response to the user’s action. That response provides the user feedback, and she can modify her actions accordingly. Now, the need for competence has been defined as the desire to interact effectively with the environment, to produce

desired outcomes and prevent undesired outcomes (Deci and Ryan 1985). Hence, if the user receives quick feedback and always receives feedback, the user can learn how to achieve desired outcomes and reverse errors sooner, to prevent undesired outcomes.

Thus we propose

Hypothesis 3 (H3). *The perceptions of responsiveness while using the site will be positively related to the level of perceived competence.*

Reciprocal communication was defined as the support for bidirectional communication. We conceptualized this to include explicit features for communication, such as bulletin boards, blogs and implicit features such as feedback mechanisms. Relatedness, defined as the desire to feel connected to significant individuals, presupposes communication between such individuals. The use of these explicit tools will enable users to share messages, profiles, photos, music and other such personal information which enables relationship formation. The use of the features which provide avenues for implicit communication, such as feedback mechanisms, or provisions for ratings on a user's content, provide cues to the focal user which enable them to form impressions about the way they are perceived by others. We hypothesize that:

Hypothesis 4 (H4). *The perceptions of reciprocal communication while using the site will be positively related to the level of perceived relatedness.*

We define social presence as the degree to which users perceive the existence of others and the extent to which others interact with the focal user. If users participate in a social website, and do not perceive that any other user is present, or if they are present, no one is responding to their contributions, it is likely that they will feel discouraged. On the other hand, if a user perceives that a lot of users are using the site frequently and she gets responses to her actions, she is likely to feel acknowledged for her inputs. In psychology research, Anderson, Manoogian, and Reznick (1976) found that when children worked on an interesting task in the presence of an adult stranger who ignored them and failed to respond to their initiations, they felt a very low level of intrinsic motivation. Though this was in a non-mediated setting, the principles can be extended to CMC. Hence we have the following hypothesis:

Hypothesis 5 (H5). *The perceptions of social presence while using the site will be positively related to the level of perceived relatedness.*

Deep Profiling refers to availability of artifacts such as rankings, feedback, detailed archives of user contributions and ‘Who did what’ features (Ma and Agarwal 2007). These enable efficient identity communication along with the earlier two dimensions of Social presence and Self Presentation. Further, they also provide a context which assists in reducing attribution differences arising due to the rarity of cues afforded by CMC. Hence, if the users can form more effective judgments about the identities of others, they will be more likely to form relationships based on true or at

least with lower attribution biases, which should be associated with a higher level of relatedness. Hence we have the following hypothesis:

Hypothesis 6 (H6). *The perceptions of deep profiling while using the site will be positively related to the level of perceived relatedness.*

Self Presentation has been defined by Ma and Agarwal (2007) as the process of communicating one's identity. In the online context this can be done using signatures, avatars, personal profiles, listing of friends, listing preferred websites/music/videos and in several other ways. Since people with shared interests or tastes are more likely to communicate with one another and build relationships (Newcomb 1961), self presentation will assist in the discovery of such people. Further, one is more likely to feel related to, liked by, and acknowledged by others with similar tastes. Thus

Hypothesis 7 (H7). *The perceptions of self-presentation while using the site will be positively related to the level of perceived relatedness.*

3.3.2 Need fulfillment and Motivation

In the review on SDT presented above, we discussed the rationale and supporting literature to suggest the relationship between need fulfillment and motivation. However, there are different approaches to investigate the relationship between the three needs and the different kinds of motivation. As discussed earlier, Deci and Ryan (1985) proposed a continuum from Intrinsic motivation to Extrinsic motivation and finally Amotivation. As mentioned earlier, Extrinsic motivation itself is

forms a continuum from External regulation at one end to Integrated regulation at the other. Intrinsic motivation, integrated regulation and identified regulation are forms of self-determined motivation, while introjected regulation, external regulation and amotivation are non self-determined. While the operationalization of motivation as discussed above allows us to do a fine grained analysis, the objective of this research is not to individually investigate the kinds of motivation associated with need fulfillment. Instead, we propose motivation as a construct composed of the different dimensions and, along with the background of the previous discussion on SDT, hypothesize that need fulfillment is positively associated with motivation.

Hypothesis 8a (H8a). *The perception of autonomy while using the website will be positively related to motivation.*

Hypothesis 8b (H8b). *The perception of competence while using the website will be positively related to motivation.*

Hypothesis 8c (H8c). *The perception of relatedness while using the website will be positively related to motivation.*

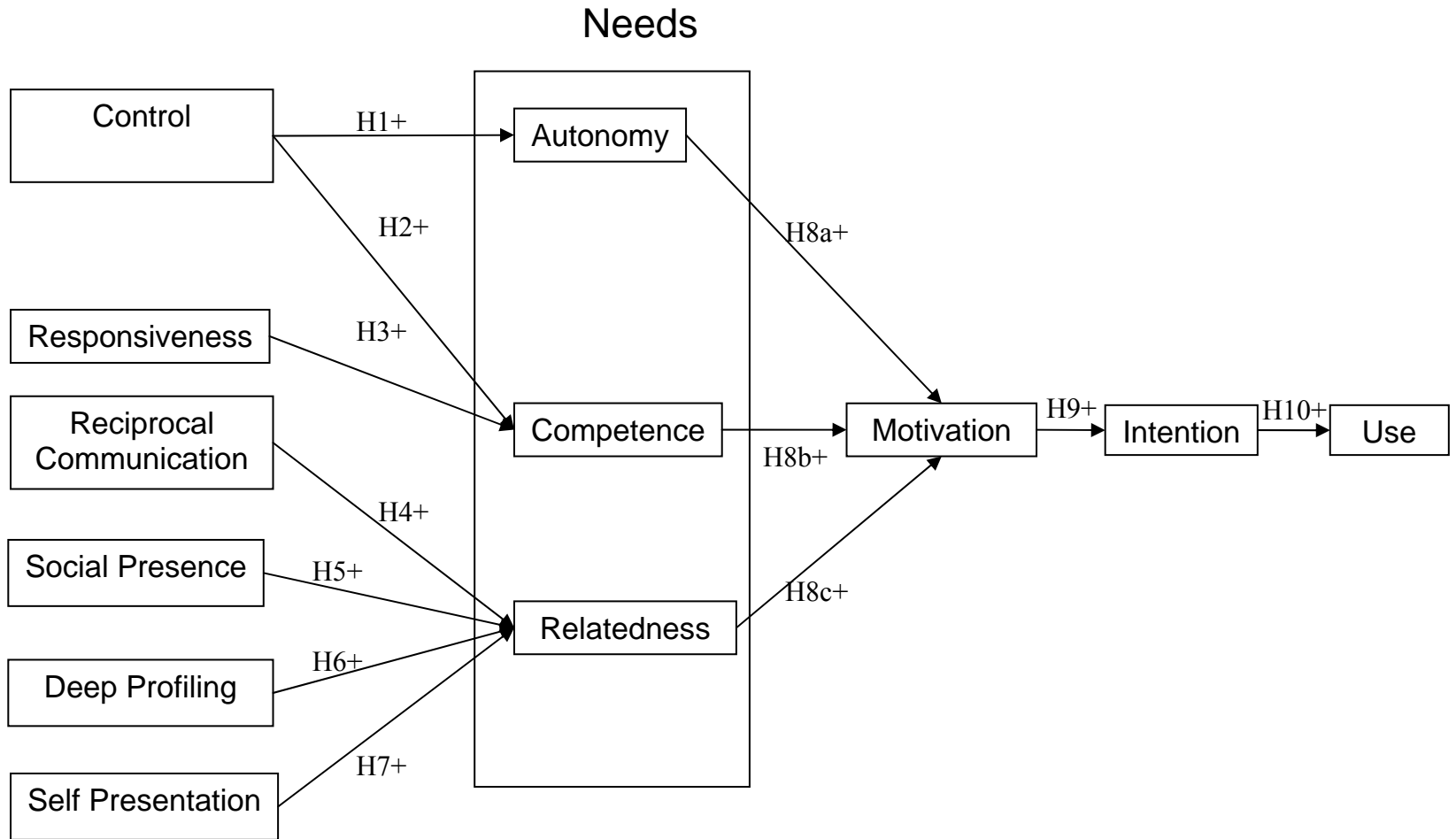


Figure 3.1 Research Model

3.3.3 Motivation to Behavior

The literature review on SDT laid the grounds for the relationship between motivation and behavior in several life contexts. In the IS context, Atkinson and Kydd(1997) found that for students intrinsic motivation was important in predicting WWW use for entertainment, while extrinsic motivation was important in predicting WWW use for course related purposes. There have been other attempts to integrate motivation into the IS adoption and acceptance literature, with varied conceptualizations, that differ from our formulation. For example Venkatesh (2000) conceptualized intrinsic motivation as computer playfulness (Webster and Martocchio 1992) and considered it as one factor influencing perceived ease of use, which is an established antecedent of Intention to use. However, it seems that much of the research confuses the antecedents of motivation or the consequences of motivation, with motivation itself. As Vallerand (1997) explains, it is important to separate the measurement of motivation and its effects or consequences carefully. Consistent with extant literature on TAM, we investigate the impact of motivation on intentions and subsequent impact on actual use. In line with SDT, which proposes that higher levels of self-determined motivation will be associated with more positive outcomes, we propose

Hypothesis 9 (H9). *Higher levels of the motivation will be associated with higher intentions of continued use of the focal website.*

Hypothesis 10 (H10). *Intentions to continue using the website will be positively associated with actual use of the focal website.*

3.4 Control Variables

Based on the literature survey, and our research problem, we considered four control variables: Age, Gender, Race and Tenure on the website. Age and Gender were included as standard demographic variables, since there have been conflicting reports about the impact of these two variables in different studies. Race was included since the research was to be conducted with students in two different locations with a different racial mix. Finally, the respondent's tenure on the particular website was expected to have a positive impact on competence and relatedness. Users who have been using the particular website for a long time, were expected to report higher levels of competence. Further, on the sites that aim to provide interaction among users, a longer tenure could mean that the user has set up more relationships, such as friend circles on Facebook or has joined more groups, and may report higher levels of relatedness. We did not include the common control of internet experience, as we felt that for the target population this control would be redundant, since most of them would have significant internet experience.

3.5 Research Methodology

3.5.1 Data Collection

We tested the hypotheses using a web based survey which was administered to students in a lab. The students were asked to respond about their usage of one of the websites provided in the survey. This list of websites was created by using the following guidelines. First, the site should enable user to user interaction, and second, it should allow user generated content (text, images, videos). Using these two criteria, the

websites drawing the high amounts of traffic were selected from popular media, and websites such as www.web2list.com and <http://momb.socio-kybernetics.net>. The breadth of the selection was considered keeping in mind the target audience of students. The survey was pretested in two phases. First, it was distributed to seven faculty members at four different universities to get feedback on the language, presentation and the face validity of the items. The feedback in this stage was mostly about the way the questionnaire was presented. A few suggestions on rewording some of the items were received and incorporated. In the second phase, we conducted a pilot survey of the survey with 30 students, where we evaluated the time that students took to answer the questions and also solicited unstructured feedback at the end of the survey about the language of the items and any problems they had while navigating the survey. There was no significant feedback in this stage.

In an attempt to ensure that the users answered the questions accurately in the context of the website in question, the users were prompted to use the website for ten minutes during the survey and then answer the questions. However, this was only a guideline and we could not enforce this condition. Since we were capturing the time taken to complete the survey, we conducted an outlier analysis on the time taken to complete the survey and did not find any outlier in the observations where the respondent took too little time. We also captured the length of time that they have been using the site, and most of them have been using the websites for more than 6 months, so we were reassured that their responses were relevant.

The survey was voluntary and students were provided with an incentive to participate in a drawing for one of five IPOD shuffles. Out of the 374 students who were asked to participate in the survey, we received 227 responses, representing a response rate of 60.7 %. One of the responses was incomplete, while one response seemed to be spurious, so they were removed. We discuss the missing values and outliers later. Table 3.1 below represents the demographic profile of the 225 respondents.

Table 3.1 Demographic Information

		Frequency	Percent
Tenure	More than a year	169	75.11
	6-12 months	29	12.89
	1-6 months	18	8.00
	Less than a week	5	2.22
	One Month	4	1.78
Age	18-24	196	87.11
	25-35	22	9.78
	35-45	5	2.22
	>45	2	0.89
Gender	Male	130	57.78
	Female	95	42.22
Race	Caucasian/White	170	75.56
	African American/Black	31	13.78
	Asian	13	5.78
	Middle Eastern	7	3.11
	American Indian or Alaska Native (AIAN)	2	0.89
	Hispanic	1	0.44
	Native Hawaiian or Other Pacific Islander (NHOPI)	1	0.44

Since the sample was students, the age distribution is heavily concentrated in the 18-24 range. The high percentage of users who have been using the focal site for more than 6 months gives us confidence that their responses would be relevant, even if they did not spend time to view the website during the survey.

3.5.2 Construct Operationalization

The survey items are available in Appendix B. Table 3.2 below indicates the origin of the items for each of the constructs and whether the construct was formative or reflective.

Table 3.2 Constructs and their Sources

Construct	Formative/Reflective	Reference
Control	Reflective	Liu and Shrum(2002)
Responsiveness	Reflective	
Reciprocal Communication	Reflective	
Social Presence	Formative	Ma and Agarwal (2007)
Deep Profiling	Formative	
Self Presentation	Formative	
Autonomy	Reflective	Deci et al. (2001)
Competence	Reflective	
Relatedness	Reflective	
Motivation	Formative	Guay et al. (2000)
Intention to Use	Reflective	Chang and Cheung (2001), Castaneda et al. (2007).

For measuring social presence, self-presentation and deep profiling, we adapt the scales from Ma and Agarwal (2007) as they proposed the original constructs. The authors had proposed virtual copresence (modified and labeled as social presence for our study) and self-presentation as formative constructs, rather than reflective. If the construct in consideration is multi-dimensional, where the different dimensions need

not be correlated, then the construct can be said to be caused by the indicators. For example, in our study, the perception that the website enables self-presentation is measured using items such as “I can tell my stories to other users on this website” and “I can use a unique identifier on this website that will differentiate me from other users”. Now it is not necessary that if a user has a unique identifier, the website will also enable sharing of personal experiences or stories. Hence the responses to these items need not correlate. However, both these items are important to capture the multidimensional construct of self-presentation and thus they can be said to ‘cause’ the construct and be considered formative indicators. This is in contrast to reflective indicators, where the items are a way of measuring the same dimensions of the construct and are expected to load together, in order for them to be good measures of the construct. We follow the guidelines by Diamantopoulos and Winklhofer (2001) regarding the creation and validation of the formative indicators, for these two constructs and the other formative constructs we propose. Though the items created by Ma and Agarwal (2007) for these constructs followed these guidelines as well, the context for their research was user’s knowledge contribution in two specific online communities. In our context we were considering the role of these constructs in influencing the perception of relatedness with other users and hence we modify the items accordingly. We had to drop items from the scale developed by the authors which were specific to these two communities, since our website sample was quite varied. In addition to self-presentation and social presence, we also conceptualize deep profiling as a formative construct, rather than reflective as was done by Ma and Agarwal(2007).

In the original study the items were measuring a user's perceptions of what information about her was being viewed/considered by the other users while interacting with her. In our study, we want to measure the ease of finding information about another user who is the subject of a possible interaction. A review of the items in Appendix B will show that the items may not correlate, but all of them are valid items to measure the availability of profile information for other users. This list of items was generated after an extensive review of the sites in our sample and we attempted to make the items general enough to apply across several websites.

For the other three dimensions of control, responsiveness and reciprocal communication, we adapt the items from Liu and Shrum (2002), and create some additional items to measure the constructs for our context. Reciprocal communication is also conceptualized as a formative construct, since we are capturing perception of ease of communication between the user and the website as well as ease of communication among users. So a website need not offer features to support both types of communication. For the construct, intention for continued use, we adapt the items from Chang and Cheung (2001) and Castaneda et al. (2007). Finally, for actual use, we measure the frequency of use of the website in the last month as a proxy, with a single item. All the main constructs are measured on a 7-point Likert scale, from 'strongly agree' to 'strongly disagree', or equivalent labels, such as 'corresponds exactly' to 'does not correspond at all' for the motivation scale items.

Since the theory base in SDT is very well developed and widely tested in several life domains such as education, sports, interpersonal relationships and health,

the items for the three needs, autonomy, competence and relatedness, and the items for motivation are readily available and are very well validated. The Basic Need Satisfaction at work scale (Deci et al. 2001) with 21 items has been modified and a shorter version of 12 items was used. The Situational Motivation scale (Guay et al. 2000) developed to measure four dimensions of Motivation (intrinsic, identified regulation, external regulation, amotivation) was used. This scale consists of four subscales for each of the dimensions with four items each. In order to prevent respondent fatigue, we reduced each of the subscales to three items each, giving a total of 12 items, by removing items that were not directly relevant to the context of usage of websites. In line with extant literature on the weighting of these subdimensions (Vallerand et al. 1997, Vallerand 1997, Grouzet et al. 2004), weights of +2, +1, -1, and -2 were assigned to intrinsic motivation, identified regulation, external regulation and amotivation respectively. This weighting scheme indicates a positive weight for self-determined forms of motivation and a negative score for non self-determined forms of motivation. Grouzet et al. (2004) combined these four subscale scores into one motivation index, in order to reduce the number of indicators in the model and their approach is quite sound. In another approach Vallerand et al. (1997) used an earlier version of the motivation scale by creating four indices for the different motivation dimensions and treated them as reflective indicators of a single motivation construct, using structured equation modeling (SEM). Both these studies report that they did this aggregation in order to reduce the number of indicators in the model, due to sample size restrictions. However, given the fact that both the formulations suggest that the four

dimensions form the motivation construct, and we are not restricted by sample size, we use these weighted items as direct formative indicators of motivation. This helps us retain the information in all the indicators, which we would lose by working with a composite score. This scale does not measure the two dimensions of identified regulation and introjected regulation. The authors validated this scale in five studies with student populations, both in field and laboratory settings in the contexts of education, interpersonal relationships and sports. Given the context for creation and validation of this scale, it was appropriate to use it in our context with a student sample, even though it does not measure the two dimensions mentioned above.

3.6 Data Analysis

3.6.1 Analysis Method

Since we are proposing a multiple mediated model with several complex relationships to be tested, structural equation modeling was an appropriate technique to be used. We use partial least squares (PLS) as the technique using PLS Graph Version 3, Build 1130 (Courtesy of Dr. Chin, University of Houston). The PLS method estimates the weights and loadings used to create the latent variable scores, then the relationships between latent variables and their associated observed or manifest variables, and finally the regression coefficients for the indicators and latent variables (Chin and Newsted, 1999). PLS was chosen over the covariance based methods such as LISREL, for the following reasons. First and foremost, it accepts formative constructs in the model, unlike other approaches such as LISREL (Chin 1998). Second, it is considered more appropriate for prediction and exploratory research, while LISREL is

more appropriate for theory testing (Fornell and Bookstein 1982). Finally, PLS does not place many restrictive assumptions on the data, such as multivariate normality.

We start with screening the data and examine the descriptive values. We then report on the control variables analysis. We discuss the attempt to reduce the common method bias inherent in our research design. We present the results of the measurement model before discussing the structural model as recommended by Hair et al. (1998).

3.6.2 Data Screening

We first conducted an exploratory analysis on the data looking for outliers and missing data in the model. Out of the 227 responses, we found one response which was missing large chunks of the data and one which had spurious data and both were discarded. There were 41 missing data points in the remaining 225 responses, with the total data points being over 14,000. This represented 0.28% of the total and is quite insignificant. According to the guidelines by Tabachnik and Fidel (2001), any variable having less than 5% of missing values can be ignored. We did not have any variable where the missing values were more than 5% (11 for our sample size). For the items measuring motivation, we used a mean substitution for the missing values (13 out of 780) since we are calculating subscale scores. For all the other variables we coded the missing values with a global value of -1, since PLS GRAPH can incorporate missing values. A univariate outlier analysis was conducted by using the scale scores (mean of the item scores for the construct) for the IV's Control, Responsiveness, Reciprocal Communication, Social Presence, Self Presentation and Deep Profiling and the time taken to complete the survey. According to the recommendations by Hair et al. (1998),

for a large sample size, a standardized score value of (+/-) 3 to 4 can be used as a benchmark to identify outliers. We found 15 responses which had an outlier in one or more of the variables above. We did a detailed inspection of the 15 items and focused on the responses that had an outlier on more than one variable. We found 4 responses which respondents took too much time to complete the survey, but that was not a concern. We were more concerned about responses where they took too little time. There was only one case which was an outlier on 5 variables, but we decided to include it since the response seemed to be genuine and this seemed like important variation in the data. The spurious response which was excluded from the analysis was also identified as an outlier. In the final analysis we used 225 responses.

The descriptive statistics for the scale score for the multi item constructs are presented below in Table 3.3. As is evident from the data, most of the scale values show significant skewness, since many of the statistic values lie outside the range of +/- 2 times the standard error for the statistic. Using a similar criterion for the Kurtosis statistics, we see that three variables are exhibiting kurtosis. This deviation from normality is not a major concern, since PLS does not require assumptions of normality.

Table 3.3 Descriptive Statistics

	Minimum	Maximum	Mean	S.D	Skewness Statistic	Kurtosis Statistic
Autonomy(AUTO)	3.00	7.00	5.83	0.90	-0.84	0.61
Competence(COMP)	1.75	7.00	4.69	0.92	-0.12	0.33
Relatedness(RELA)	1.50	7.00	5.27	1.30	-0.85	0.05
Control(CTR)	2.25	7.00	5.60	0.86	-0.66	0.73

Table 3.3 – continued

Responsiveness(RESP)	2.25	7.00	5.62	0.86	-0.83	1.18
Communication(COMM)	3.00	7.00	5.44	0.85	-0.37	0.00
Social Presence(PRES)	1.00	7.00	5.35	1.48	-0.92	0.10
Deep Profiling (PROF)	2.25	7.00	5.43	1.08	-0.71	0.11
Self Presentation(SPRES)	2.80	7.00	6.02	0.92	-1.15	1.07
	Skewness Std. error		0.16			
	Kurtosis Std. error		0.32			

3.6.3 Control Variable Analysis

The four control variables of Age, Gender, Race and Tenure on the website were entered into the model as IV's. There is a lack of literature on how to deal with control variables in PLS. Some research has hypothesized relationships between specific control variables and constructs of interest (Ma and Agarwal 2007), while others have proposed testing relationships between the control variables and every construct in the model (Bliemel and Hassanein 2006). Since we have a multiple mediated model, we followed the common practice followed in covariance based approaches such as LISREL and entered the control variables as IV's to the first level DV's of autonomy, competence and relatedness. The relationship gender-competence and race-relatedness was found to be significant at $p < 0.05$ with a two tailed t-test and were kept in the model. Age and tenure on the website were not significantly related to any of the variables and were dropped from further analysis. However, the results for age and tenure on the website need to be interpreted with caution, since there is very little variation in the data, as shown in the demographic data above.

3.6.4 Common Method Bias

This threat to validity has been widely discussed and is particularly salient for self-report studies (Bagozzi et al. 1991). This bias is a source of measurement error and can threaten the validity of our conclusions (Podsakoff et al. 2003). Harman's one-factor test was used to assess the impact of common method bias (Podsakoff et al. 1984). All the items (except the single items measures) were used for an exploratory factor analysis and factors were extracted with eigenvalues greater than one. The unrotated solutions gave 13 factors with one factor explaining approximately 21% of the variance and all the others were less than 10 %. The total variance explained was 67.7%. The rotated solution gave all factors with variance explained below 10%. These figures indicate that there was no single factor which was explaining a significant portion of the variance, leading us to believe that common method variance is not a significant problem.

3.6.5 Measurement Model

The measurement model can be evaluated by considering the indicator reliabilities, the convergent validity of the indicators for each construct, and the discriminant validity. Since we have five formative constructs (reciprocal communication, self-presentation, deep profiling, social presence and motivation) they are excluded from the measurement model analysis, since it is not meaningful to calculate reliabilities of the indicators and convergent/discriminant validity for them (Bagozzi 1994, Bollen 1989). Instead, we follow the procedure outlined by Diamantopoulos and Winklhofer (2001) for investigating the validity of measuring

these constructs. We check for collinearity and exclude the indicators which are highly collinear, since they will be redundant in causing the latent variable (Bollen and Lennox 1991). In the four constructs none of the indicators had a VIF greater than 4, much less than the heuristic of 10. However on further investigation we found that the condition index values for two indicators of the self-presentation construct (SPRE 3 and SPRE4) were quite high (22.8, 35.5), and these indicators also had the highest VIF values. We also found a high correlation between SPRE2 and SPRE4 (0.839). After evaluating the item, we decided that we would drop SPRE4 as we would not be losing any significant dimension of the construct.

For the reflective items we analyzed the loadings of the indicators on the respective latent constructs obtained from PLS Graph. This resulted in three indicators, CTR2, RESP3, COMP1 with loadings less than 0.6 being dropped from further consideration. Two other indicators CTR1 and RESP4, with loadings between 0.6 and 0.7, were kept in the model, since their t-values are significant and we don't want to estimate the constructs with too few indicators. Further, these indicators were capturing some important dimensions of the construct. With this trimmed model, we used the bootstrap procedure (200 samples) to generate the composite reliabilities, the average variance extracted (AVE) and the t-statistics for the path coefficients. The composite reliability of the construct, indicator loadings and their respective t-values are given in table 3.4 below. Composite reliability is reported, since it is considered a more appropriate measure of internal consistency compared to the Cronbach's α , as it considers the actual loadings while calculating the indicators (Ma and Agarwal 2007).

A composite reliability value above 0.70 is considered a good indicator of internal consistency (Hair et al. 1998). The reliabilities of the constructs control and responsiveness fall short of this heuristic, which may be due to our decision to keep items with lower than recommended loadings. AVE values above 0.5 are indicative of convergent validity (Fornell et al. 1981). Considering these heuristics, the data below indicates that our measurement model is internally consistent and exhibits convergent validity.

Table 3.4 Indicator Loadings and Composite Reliabilities

	Composite Reliability	AVE	Loading	Std. Error	T-Statistic
Control	0.743	0.495			
CTR1			0.59	0.10	5.84
CTR3			0.77	0.05	14.41
CTR4			0.74	0.07	11.03
Responsiveness	0.779	0.544			
RESP1			0.78	0.10	7.82
RESP2			0.74	0.10	7.51
RESP4			0.63	0.14	4.40
Autonomy:	0.812	0.59			
AUTO1			0.76	0.04	17.12
AUTO2			0.76	0.05	14.03
AUTO3			0.77	0.05	14.13
Competence	0.831	0.622			
COMP2			0.76	0.04	20.76
COMP3			0.83	0.03	30.50
COMP4			0.77	0.04	20.20
Relatedness	0.874	0.582			
RELA1			0.79	0.04	20.68
RELA2			0.81	0.03	24.31
RELA3			0.81	0.03	23.75
RELA4			0.70	0.05	14.50
RELA5			0.66	0.06	10.82
Intention	0.899	0.751			
INT1			0.93	0.02	48.48

Table 3.4 – continued

INT2			0.70	0.09	7.89
INT3			0.93	0.01	71.68

The constructs are said to exhibit discriminant validity, if the AVE for the construct is greater than the bi-variate construct correlations (Compeau et al. 1999) and if the indicators load higher on their respective constructs when compared to other indicators. Table 3.5 shows the square root of the AVE on the diagonal and the bi-variate construct correlations on the off diagonal elements. Using the AVE (rather than the square root) in the comparison is a stricter validation criterion, but our data meets that requirement too. The values for the formative constructs are not reported. The shared variance within all the constructs is greater than the bi-variate correlations indicating discriminant validity.

Table 3.5 AVE and Construct Correlations

	CTR	RESP	COMM	PRES	PROF	SPRES
CTR	0.70					
RESP	0.39	0.74				
COMM	0.28	0.31	NA			
PRES	0.38	0.30	0.52	NA		
PROF	0.32	0.38	0.42	0.59	NA	
SPRES	0.32	0.35	0.53	0.55	0.49	NA
AUTO	0.45	0.44	0.47	0.50	0.48	0.54
COMP	0.31	0.30	0.12	0.18	0.25	0.14
RELA	0.30	0.27	0.60	0.61	0.41	0.62
MOT	0.21	0.24	0.29	0.20	0.25	0.14
INT	0.25	0.23	0.36	0.23	0.18	0.23
	AUTO	COMP	RELA	MOT	INT	
AUTO	0.77					
COMP	0.42	0.79				
RELA	0.46	0.16	0.76			

Table 3.5 – continued

MOT	0.44	0.62	0.27	NA	
INT	0.42	0.30	0.35	0.56	0.87

Note: Control(CTR), Responsiveness(RESP), Reciprocal Communication(COMM), Social Presence(PRES), Deep Profiling (PROF), Self Presentation(SPRES), Autonomy(AUTO), Competence(COMP), Relatedness(RELA), Motivation(MOT), Intention(INT)

Finally, we conduct a confirmatory factor analysis for all the reflective constructs and report the results in table 3.6. We extract 6 factors with promax rotation as we expect the factors to be correlated. As we saw earlier, RESP4 is a problem item in this analysis. Further CTR4 is loading higher with autonomy, compared to CTR1 which had lower loadings in the earlier analysis. This suggests the need for improvement in the control and responsiveness constructs. Another concern is the factor structure for autonomy. It is cross loading on competence and relatedness. Since the scales for autonomy, relatedness and competence are modifications from existing validated scales and we have removed items that are not relevant to our context, we would have expected good discriminant validity. However, it seems that a more thorough scale development effort is required for measuring autonomy in the social computing context. This raises some concerns about the discriminant validity of the model, but we feel that the AVE analysis reported earlier should give us confidence in the model.

Table 3.6 Confirmatory Factor Analysis

	Relatedness	Intention	Competence	Autonomy	Responsiveness	Control
CTR1	0.09	0.23	0.11	0.17	0.28	0.70
CTR3	0.16	0.11	0.32	0.41	0.02	0.63
CTR4	0.41	0.01	0.31	0.75	-0.01	0.31
RESP1	0.16	0.17	0.22	0.17	0.88	0.06
RESP2	0.11	0.20	0.16	0.26	0.84	0.32

Table 3.6 – continued

RESP4	0.30	0.16	0.21	0.87	0.20	0.19
AUTO1	0.27	0.36	0.28	0.68	0.30	0.31
AUTO2	0.49	0.24	0.41	0.37	0.21	0.40
AUTO3	0.48	0.46	0.52	0.43	0.27	0.34
COMP2	-0.01	0.33	0.63	0.33	0.29	0.10
COMP3	0.12	0.10	0.82	0.17	0.11	0.19
COMP4	0.21	0.12	0.78	0.23	0.08	0.32
RELA1	0.76	0.48	0.03	0.33	0.15	-0.07
RELA2	0.83	0.10	0.28	0.33	0.09	0.37
RELA3	0.83	0.08	0.37	0.31	0.00	0.29
RELA4	0.72	0.32	-0.18	0.29	0.22	-0.20
RELA5	0.64	0.44	-0.01	0.29	0.20	-0.27
INT1	0.24	0.83	0.26	0.23	0.18	0.18
INT2	0.28	0.81	-0.05	0.15	0.21	-0.01
INT3	0.27	0.83	0.40	0.30	0.21	0.22

For the motivation construct, we did a factor analysis on the 12 items to establish the four factor structure posited by earlier literature and evaluated the reliabilities of the four subscales independently. Based on this analysis we dropped one item each from the three subscales for intrinsic motivation (MOT9, $\alpha=0.77$), identified regulation (MOT6, $\alpha=0.68$) and external regulation (MOT7, $\alpha=0.67$). The amotivation subscale ($\alpha=0.77$) was not modified.

3.6.6 Hypothesis Tests

The structural model was evaluated next with the path coefficients and their associated t-values obtained from the bootstrap output from PLS Graph. Most of the hypotheses are supported with p values less than 0.01, except for the relationships indicated as summarized in table 3.7 below and depicted in the figure 3.2.

Table 3.7 Summary of Hypothesis Testing

	Hypothesis	Result
H1	The perceptions of control while using the site will be positively related to the level of perceived autonomy	Supported
H2	The perceptions of control while using the site will be positively related to the level of perceived competence	Supported
H3	The perceptions of responsiveness while using the site will be positively related to the level of perceived competence	Supported
H4	The perceptions of reciprocal communication while using the site will be positively related to the level of perceived relatedness	Supported
H5	The perceptions of social presence while using the site will be positively related to the level of perceived relatedness	Supported
H6	The perceptions of deep profiling while using the site will be positively related to the level of perceived relatedness	Not Supported
H7	The perceptions of self-presentation while using the site will be positively related to the level of perceived relatedness	Supported
H8a	The perception of autonomy while using the website will be positively related to motivation	Supported
H8b	The perception of competence while using the website will be positively related to motivation	Supported
H8c	The perception of relatedness while using the website will be positively related to motivation	Weak Support
H9	Higher levels of the motivation will be associated with higher intentions of continued use of the focal website.	Supported
H10	Intentions to continue using the website will be positively associated with actual use of the focal website.	Supported

There is substantial variation explained for relatedness (59.1%), motivation (43%), intention (34.2%) and use (22.9%). The relationship between deep profiling and relatedness was not significant and the relationship between relatedness and motivation is quite weak, being significant at p less than 0.1. Deep profiling measures the

availability of detailed information about other users and their activities on the website. Relatedness is a psychological need and we measure the extent to which the user perceives that the other users care about her, relate to her and are her friends. One reason why we don't see an impact of the availability of information on relatedness could be that the user is just using the website as another means of interacting with her offline friends. Hence, she knows all the information about her friends and the additional information on the website does not really impact her relationship with her friends. However, if we had a situation when the relationship was developed completely online, then we would expect to see a relationship between deep profiling and relatedness.

The weak relationship between relatedness and motivation required a more detailed analysis. Extant literature in need fulfillment has considered relatedness a distal predictor of motivation and often ignored it from analysis. However, given our context of social computing, we expected to find a significant and strong relationship between relatedness and motivation. We have a majority of the responses from Facebook(113), Myspace(63) and Youtube(39). We conducted a one way ANOVA to check if there was a significant difference in mean levels of relatedness responses on these three sites. The results indicated that Facebook and Myspace respondents reported a higher level of relatedness compared to Youtube respondents, as expected. As we see, this variance is not adequately reflected in the variation in motivation levels. However, since ANOVA assumes normality, and relatedness does show a significant skew (skew statistic > +/- std. error), we have to interpret these results with caution. We then conducted multiple

one-way ANOVA's to check if the means of the four dimensions of motivation differed significantly across the different sites. We did not find any significant differences. Since the sample of sites is very limited, it leads us to consider that there is some other reason why Youtube respondents are reporting a motivation level similar to the other sites, and we are not capturing that. Another possible reason could be that if the users are simply extending their offline relationships online, then there may not be much of a motivation to use a site just because of its features that enable the fulfillment of the need for relatedness.

The relationship between gender and competence indicated that male respondents reported higher levels of competence while using these sites. Earlier research, particularly in education literature, has found significant effects of gender on computer competence and attitude towards computers. According to the study by Liff and Shepherd(2004) women rate their internet abilities lower than men, so our findings are not surprising. The relationship between Race and Relatedness, was analyzed and it indicated that American Indians /Alaskan Natives reported significantly different levels of relatedness. However, there were only two respondents in this category, so the results need to be interpreted with caution.

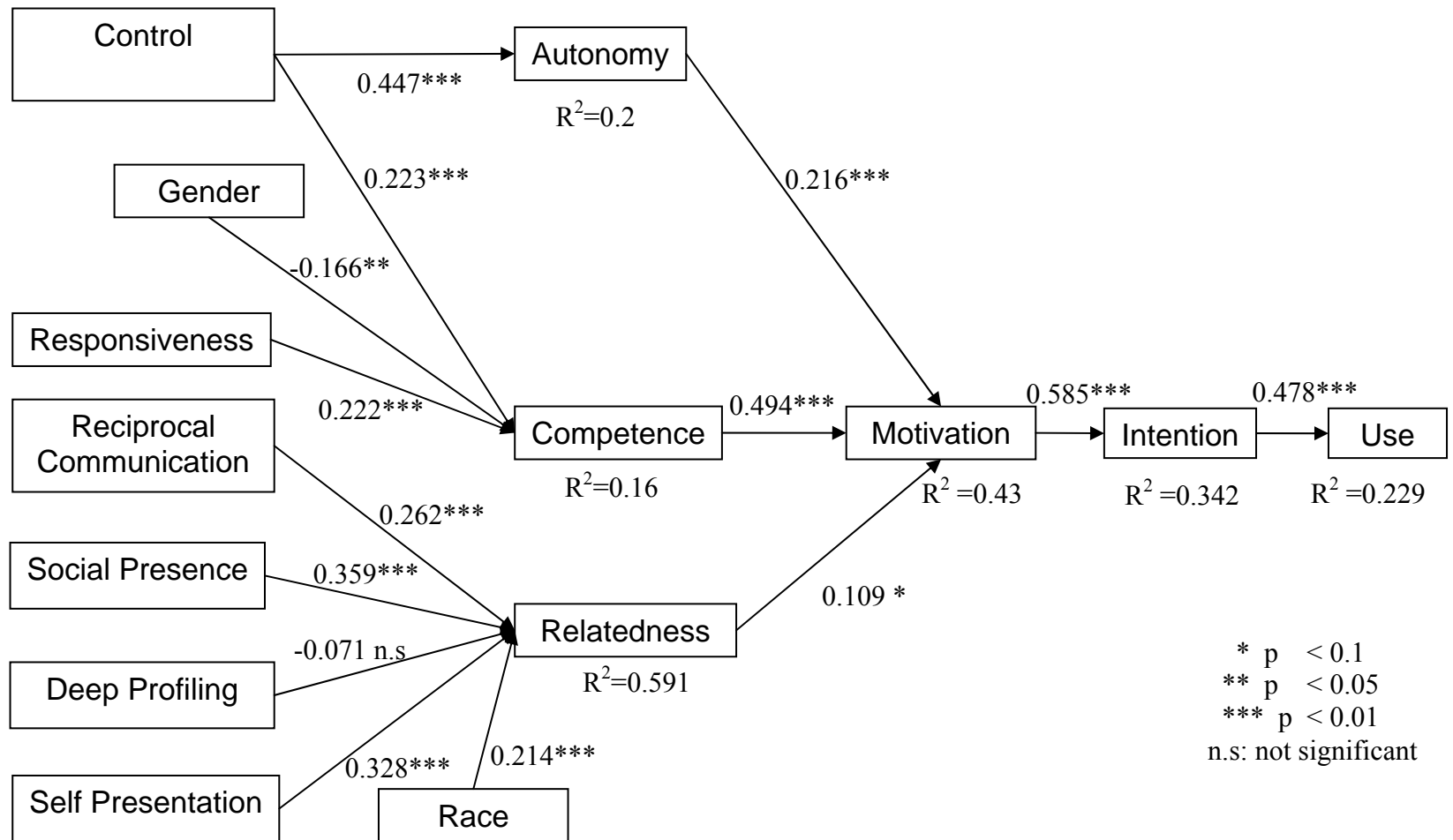


Figure 3.2 Structural Model

3.7 Discussions and Conclusion

3.7.1 Limitations

One of the major limitations of the study is the lack in variety of social computing websites in the sample. As mentioned earlier, the majority of the responses are from three websites, Myspace, Facebook and Youtube. Two of these are explicit social networking sites. While the presence of Youtube, which is not a networking site, but a media sharing site, provides some variance in the data set, we would like to repeat the study with a broader site sample. This would address the issue of generalizability of the findings. In terms of relevance of the sample used, students are a good sample for this context, but given their pattern of usage, using an exclusive student sample will lead to a limited sample of websites in the response set and a lack of variation in the age of the respondents. We would recommend that websites such as collaborative news websites such as digg.com, and collaborative news websites such as Del.icio.us should be expressly included in the sample in any future study.

Another limitation inherent in self-report surveys is the issue of common method bias. We have conducted the Harman's one-factor test to evaluate the significance of the problem and the results indicated that common method variance could not explain a significant part of the variance explained by the model.

3.7.2 Contributions to Theory

In this study, we have worked with an expanded and contextually more relevant formulation of the dimensions of interactivity and studied their relevance in explaining the fulfillment of the three core psychological needs, autonomy, competence and

relatedness. We have demonstrated the validity of the revised formulation of interactivity and its role in explaining need fulfillment and higher levels of self-determined motivation, leading to greater intentions for use and actual use. This richer formulation of interactivity will provide a good platform for other researchers to validate and/or enrich the dimensions further and investigate other constructs that could influence intention and use. We proposed several modifications to the existing operationalizations of the constructs and provide evidence of validity of the items.

Based on the literature review we have done, this study seems to be the first to validate this model of motivation (Vallerand 1997) in the context of social computing. This multiple mediated model also provides an alternate theoretical lens to the technology acceptance model (Davis 1989) in terms of predicting intentions and actual use. The traditional literature in information systems does not delve beyond cognition, since the focus was the use or adoption of systems at work. However, this study seeks to uncover the reasons for using systems outside the work context, by going beyond the 'black box' of human cognition and exploring human motivation, which is more relevant for this context.

3.7.3 Contributions to Practice

The explosive increase in social computing and the associated frenzy in the media around the success of websites such as Myspace, Facebook and Youtube have lead to a mushrooming of websites in this space. In order to succeed in this crowded space, it would be useful for website designers to consider the expanded conceptualization of interactivity. By validating the importance of the new dimensions

of interactivity, we provide practitioners with a guide to design their sites to incorporate features that enable perceptions of social presence and allow for self-presentation. For example, recently Youtube has incorporated a feature, where a user can see that other users are also viewing the video that she is viewing, aiding the perception of social presence. As we saw in the data analysis, the mean level of relatedness reported by users of Youtube was lower than Myspace and Facebook. This new feature may help reduce this difference.

3.7.4 Future Research

In terms of future research, we would encourage researchers to investigate the reasons for the weak relationship between relatedness and motivation. We propose to repeat the study in a more representative sample of websites. We would specifically like to target respondents who have created new relationships online, rather than just taking offline relationships online. A good example of this would be seniors in old age homes who are known to use the internet to overcome loneliness, initiating new relationships online. Further, since 87% of our respondents were in the 18-24 demographic, using seniors might give some required variation in the age of the respondents.

In order to predict causal relationships, a longitudinal study would be ideal for this context, since we have a multiple stage model. As posited by Vallerand (1997), there is a hierarchical model of motivation with a feedback loop between the global, contextual and situational levels of need fulfillment and motivation. In our model, we have focused as the situational level, with respect to the users' experience with a particular website. To avoid respondent fatigue we did not include any constructs that

measured the global or contextual need or motivation levels. However, it may be useful to examine these as moderators of some of the key relationships in the model.

In the same vein, we did not include other individual level variables in the model in the interest of parsimony, but some of them may have an impact on our results. For example, consider the trait of self-monitoring. According to Snyder (1974), people differ in the extent to which they control their public expressions, or self-monitoring. So people high in self-monitoring will adapt their responses to their social context, in order to be appropriate, while those low in self-monitoring may not (Gangestad and Snyder 2000). If individuals high in self-monitoring, are using these social websites, just to be part of a club, so that they are not left out, this may be lowering their self-determined motivation scores, so it would be a good control variable. Alternately, in a review of the various hypotheses related to this construct, Gangestad and Snyder (2000) mention its role in influencing individual orientations towards social interactions. This may impact their perception of need fulfillment. Another, individual level variable that has been studied extensively is the need for cognition (NFC) (Cacioppo and Petty 1982). Individuals with a high NFC welcome effortful thinking, such as puzzle solving and extensive information search, while individuals low in NFC would avoid such situations. Consider a site such as MySpace.com, which offers complete customization of the personal space for the user, where the user may also be developing the website herself. Now, an individual with a low need for cognition may stay away from MySpace, as they do not want so much control over the medium, since

it involves too much processing. So the individual NFC may impact user motivations about using these sites.

Finally, it would be useful to triangulate the results of this study by conducting experiments where levels of the dimensions of interactivity can be controlled, thus providing stronger causal arguments.

CHAPTER 4

DESIGN PARADIGMS FOR SOCIAL COMPUTING

4.1 Introduction

The recent emergences of websites such as MySpace, Facebook, Youtube, Flickr and others have generated a lot of interest. These websites have been attracting a lot of visitors and these visitors have been staying on longer, according to the statistics from the internet research firm Hitwise (2007). This surge in numbers and the increasing popularity of these websites in the lucrative 18-24 demographic has led to a number of high profile acquisitions. The latest deal where Microsoft bought a 1.6% stake in Facebook for \$240 million (Greene 2007), values Facebook at approximately \$ 15 billion, a far cry from the seemingly inflated price of \$1.6 billion that Google paid for Youtube. Though it is highly unlikely that Facebook actually gets a bidder at that valuation, these figures provide a context to understand the commercial value in these websites. Since the barriers to entry are very low, there are hundreds of clones trying to attract enough users to become an attractive takeover target. Given this background, it is important to step back and consider why these websites are attracting so many users. Before we do that, let us define what sites we are referring to.

The term Web 2.0, coined by O’Rielly (2004), has been often used to describe a

second generation of the internet, which envisages the web as a computing platform, rather than just a publishing platform, where users control their own data. This umbrella term has also been associated with any website that enables user participation, be it user to user, user to interface or user to website administrators/developers. Successful websites in this sphere capture the network effects arising out of the actions of the users of their website. For example, Youtube is popular because the more each user uses the site, which may be in the form of uploading videos, viewing them, giving comments or adding it to their list of favorites, more value is generated for other users. There have been several extensions to the term Web 2.0, and it does not lend itself to a clear definition. In order to scope our research, we focus on those websites where the user takes an active role in the use of the website, which may be in the form of creating content or modifying the interface, and can communicate, collaborate, share with others. We give the label "Social Computing" to this type of computing experience.

With the scope of our discussion defined above, let us consider the design paradigms that inform the development of these websites. The traditional thinking in design followed the dictum *form follows function*, first coined by Louis Sullivan in 1896 (Michl 1995). In his review of the evolution of design, Michl(1995) contends that function meant an objective purpose of the intended system or product, rather than a subjective report from a client or a user. This purpose would determine an associated form, often decided by the aesthetic priorities of the designer, irrespective of what the user or client thought. As expected, this perspective has not been very successful lately, given the importance being given to user centered design. The emergence of agile

system design methodologies, where the user works closely with the development team, is one such advancement in software application development. Similarly, user participation in application/website design is a central meme under the Web 2.0 umbrella (O’Rielly 2004).

In another perspective on design, Norman (2004) explicates the importance of emotions in determining what and how much of a particular thing we use in our daily lives. He talks about the three aspects of design: visceral (concerned with appearance), behavioral (pleasure and effectiveness of use) and finally, reflective (does it appeal to the users self-image or pride etc.). These aspects of design consider the cognitive and affective evaluations by the customer. Following the developments in design philosophy, we proposed that interactivity, as defined in the functionalist tradition, needs to be expanded keeping in mind the discussion above. Interactivity has had many conceptualizations, with earlier ones focusing on a mechanistic view. This perspective, akin to the view held by functionalist designers, referred to interactivity as a property of the medium where designers created interactive websites based on their perception of interactivity. Later conceptualizations focus on user perceptions of interactivity rather than medium centric definitions. We propose a revised formulation of interactivity, labeled SCI, where we introduce affective components of interactivity. Our revised definition for SCI is: *“SCI, in the context of websites where the computing experience extends from the individual to the social, is the degree to which the website is perceived to: a) enable control; b) exhibit responsiveness; c) enable reciprocal communication,*

both user-medium and user-user; d)enable social presence; and e) provide capabilities for self-presentation and deep profiling”.

The premise is that these dimensions of interactivity have a role to play in meeting some psychological needs of the users and can thus help explain the extent of use of these websites. We expanded the three core dimensions of control, responsiveness and reciprocal communication to make them relevant to the social computing domain. These three dimensions are most often used in CMC and HCI literature on interactivity and form the core of interactivity. Since the computing experience has extended from the individual to the social, we contend that there are several new dimensions that become relevant. Building on research conducted by Ma and Agarwal(2007), we propose three new dimensions of interactivity, namely, self-presentation, social presence and deep profiling. These refer to the ability of the website to enable presentation of information about oneself to other users (self-presentation), the availability of detailed archival information about other users such as earlier posts, reputation etc. (deep profiling), and the capability of the website to simulate the presence of others virtually (social presence). As you see in the Figure 4.1 below, SCI, seeks to tap into the social experience around computing.

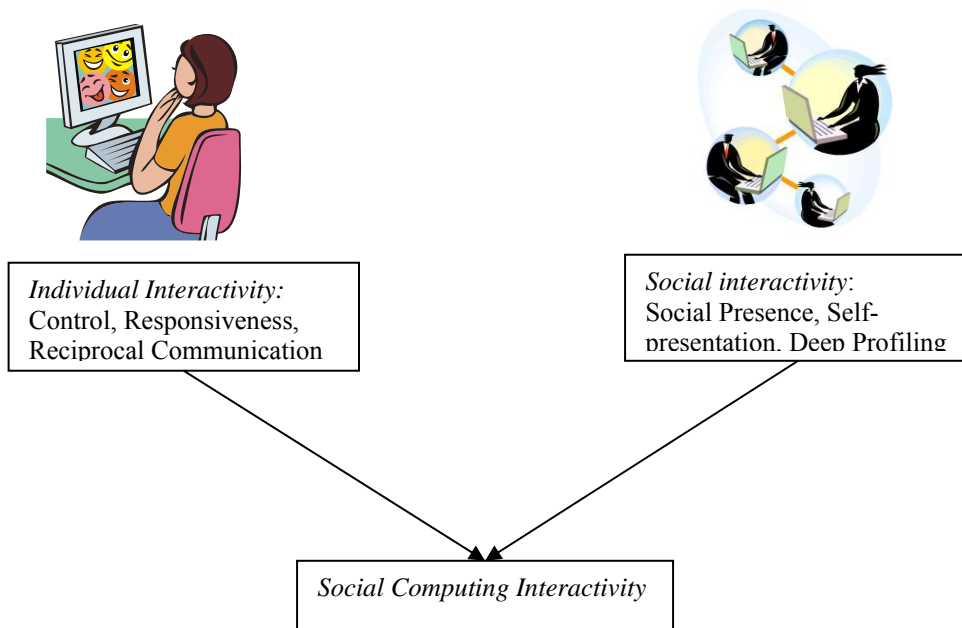


Figure 4.1 Social Computing Interactivity

We contend that the use of these websites must be satisfying some needs, which can be a motivator for continued use of these websites. SDT (Deci and Ryan 1985, 2000) provides such a perspective. The theory contends that all humans have some basic psychological needs and fulfillment of these needs is positively associated with psychological well being and higher levels of self-determined motivation, which subsequently results in persistent behavior. The three needs are autonomy, competence and relatedness. We conducted an empirical investigation to examine the role of SCI in influencing the fulfillment of the three needs so that we could shed light on the reasons behind the popularity of social computing websites. The results indicate that the expanded dimensions of interactivity do significantly influence the fulfillment of these three needs which in turn leads to higher levels of self-determined motivation, thus

providing one explanation for the increasing use of these websites. The results of the study and the implications for design of social computing websites are presented below.

4.2 Discussion of our Results

The study was conducted in an undergraduate student population with 225 respondents. The students reported on their perceptions about using a particular website that they frequently use from a list provided by us. As expected the respondents were heavy users of social networking sites such as Myspace and Facebook and video sharing sites such as Youtube. Over 90% of the respondents answered the survey with references to one of these sites.

Control, defined as the ability of the user to change the content, layout, colors or any other personalization options, was positively related to the fulfillment of the need for autonomy. Putting the user in control of their data is a central meme under the web 2.0 umbrella. The need for autonomy has been defined as the desire to choose the activities one engages in (Deci and Ryan 1985) and to be the origin of one's behavior (deCharms 1968). Hence, giving the user control over her experience on the website helps in fulfilling her need for autonomy. This finding reinforces earlier literature on the importance of giving the user control in order to enhance interactivity. Considering the subsequent impact on motivation and usage, we would recommend that designers give this capability significant importance. Another significant development worth mentioning, which was not captured in our study, was the issue of control over the users privacy. As users are putting more information online, the cases of privacy violations are increasing. Consider the recent advertising initiative by Facebook, called the

Facebook beacon. This is a piece of code that Facebook partners, which could be any website selling a product, can add to their pages thus allowing a user's activity on the website to be transmitted to Facebook and displayed on the user's profile. So if a user makes a purchase on Overstock.com on the same computer on which she uses the Facebook account, her friends will read all about that in the RSS feed from her account. The problem at the time of launch was that, it was a default Opt-out model, where users would have to ask to stop the sharing of their data, rather than opt-in. Further, it seems that at launch, Overstock.com did not alert users that they could opt-out and holiday shopping information was available on user profiles on Facebook for several users, without their permission. This dimension of control will become important as users understand the value of their information, and should be an important design criterion.

Responsiveness, defined as the speed and probability of response from a website, is a form of feedback from the website to the user. Control and responsiveness were both found to be positively related to the fulfillment of the need for competence. Competence has been defined as the desire to interact effectively with the environment, to produce desired outcomes and prevent undesired outcomes (Deci and Ryan 1985). Since users are continuously interacting with the website to change the form or content or communicating with other users, getting a quick response and always getting a response, is a form of feedback and assures the user that she is competent at using the site. Recent trends in the use of AJAX technologies on many of these web 2.0 websites enable dynamic data refreshes on sections of the website, without the need for the user

to wait for the page to refresh. Such implementations would be an easy way to improve the responsiveness of the website.

Reciprocal communication and the three new dimensions of interactivity, self-presentation, social presence and deep profiling, which we proposed in the study were expected to enable fulfillment of the relatedness need for the users. Relatedness is defined as the desire to feel connected to significant individuals. We found that except for deep profiling, the three other dimensions were positively associated with fulfillment of the relatedness need. This need gets fulfilled if the user feels that others acknowledge her, care for her, are her friends etc. Features that enable reciprocal communication (user to user or user to website), such as posting messages on someone's wall on Facebook, or automatic status updates of your friends activities in your page on Facebook via RSS feeds are good examples. User to website communication would be enabled through traditional features such as feedback options, live chat facilities, or the more recent phenomenon of blogs by the company personnel.

Social presence, which is defined as the perception of the presence of other users, gets enabled by features such as the example of Youtube, where while viewing a particular video, you are shown a list of other users viewing the same video. Self-presentation, which as the name suggests, is facilitated by features that enable users to present information about themselves online, such as photographs, favorites (music, books, video, friends, etc.), ideas and thoughts (blogs) or any other feature that allows the users to express themselves. All the three dimensions discussed were found to impact the fulfillment of the relatedness need quite significantly. Further, our results

indicate that fulfillment of the three fundamental needs is important in making the users intrinsically motivated and that influences their intention to continue using the website, thus underscoring the need for website designers to implement features that enable these dimensions in social computing websites.

4.3 Managerial Implications

The traditional features of interactive websites, such as control, responsiveness and reciprocal communication, are still important and take on new meanings in the context of social computing. Control, now extends to the control on users' information, so that they can decide who gets to read their information, and what information about others do they want to receive. As users are getting used to a more interactive presence on the internet, they demand more in terms of what they can control while they are on your website. On the flip side, too many choices also may overwhelm certain users. Some users simply do not want to process this much information and make the effort of learning how to modify the website. Responsiveness takes on a whole new meaning, with users becoming increasingly impatient with any kind of delay. Several websites are now using AJAX based interfaces, where individual sections of the web page can dynamically seek data from the server, based on user inputs, without the need for a page refresh. Further, with the users moving from being both content consumers and content creators, websites need to be designed with different design criteria.

On the other hand, with the users becoming more active online and sharing their computing experience, it becomes important to consider some new features that are required for interactive websites. We recommend a particular focus on enabling users to

present information about themselves so that they may be able to have a more fulfilling experience online. At the same time they need the control to protect access to that information. Until a few years ago, virtual reality websites for the masses such as Secondlife, would have been unthinkable. Now, with the internet becoming the primary means of communication and collaboration, technologies that enable a richer user experience online are the norm. Since the focus is on a shared computing experience, it is critical for the user to be able to perceive the presence of other users, whether explicitly such as in SecondLife, or implicitly, such as in Facebook, where you see the status of your other friends in your news feed.

APPENDIX A

LIST OF WEBSITES

LIST OF WEBSITES USED IN THE SURVEY

SOCIAL NETWORKS	
Xanga.com	COLLABORATIVE NEWS
Orkut.com	Newsvine.com
Hi5.com	Digg.com
Facebook.com	Flickr.com
Ning.com	Slide.com
Linkedin.com	Yelp.com
MySpace.com	COLLABORATIVE BOOKMARKS
TagWorld.com	Librarything.com
LiveJournal.com	Del.icio.us
Bebo.com	Clipmarks.com
VIDEO SHARING	Blinklist.com
Youtube.com	Magnolia.com
Google Video	Stumbleupon.com
Videojug.com	COLLABORATIVE MUSIC
Jumpcut.com	Finetune.com
COLLABORATIVE TRAVEL	Last.fm
Travelbuddy.com	Pandora.com
Wayfaring.com	

APPENDIX B

ITEMS USED IN THE SURVEY

ITEMS USED IN THE SURVEY

	CONTROL(Reflective)
CTR1	While using this website, I could choose freely what I wanted to see
CTR 2 (dropped)	While using this website, I had no control over what I could do on the website
CTR 3	While using this website, I could control the kind of content I would see on the site.
CTR 4	While using this website, I could control the look and feel of the website.
	RESPONSIVENESS(Reflective)
RESP1	This website processed my input very quickly
RESP2	I was able to obtain the information I wanted without any delay
RESP3 (dropped)	This website was very slow in responding to my requests
RESP4	I can very quickly customize the content on this website to fit my needs.
	RECIPROCAL COMMUNICATION((Formative)
COMM1 (dropped)	This website enables two-way communication between users and the site
COMM2	This website is effective in gathering a user's feedback
COMM3	It is difficult to offer feedback on this website
COMM4	I feel that this website wants to listen to its users.
COMM5	This website enables giving feedback to other users
COMM6	This website enables effective two-way communication among users
	SOCIAL PRESENCE(Formative)
PRES1	While using this website, I am usually aware of who is logged on online.
PRES2	While using this website, I feel that other users respond to me.
	DEEP PROFILING(Formative)
PROF1	I can easily review the reputation of other users on this website.

PROF2	I can easily search the archive to find out more about a particular user on this website.
PROF3	I can easily read the previous posts of other users on this website.
PROF4	I can easily look at the profile of other users on this website to find out more about them.
	SELF PRESENTATION(Formative)
SPRE1	I can easily tell my stories to other users on this website.
SPRE2	I can easily share my photos or other personal information with users on this website.
SPRE3	I can easily express myself on this website.
SPRE4 (dropped)	I can easily present information about myself on this website.
SPRE5	I can easily create a unique identifier (avatar, signature) on this website that will differentiate me from others.
	AUTONOMY(Reflective)
AUTO1	I like the flexibility in how I use this website.
AUTO2	While using this website, I feel like I can be myself.
AUTO3	While using this website, I feel much more confident of myself.
AUTO4	While using this website, I have lots of freedom to express my ideas and opinions
	COMPETENCE(Reflective)
COMP1	While using this website, I do not feel very competent.
COMP2	While using this website, I have been able to learn interesting, new things.
COMP3	I feel a sense of accomplishment from using this website.
	RELATEDNESS(Reflective)
RELA1	I try to stay away from interacting with other users on this website.
RELA2	I consider the users I interact with on this website to be my friends.
RELA3	Users I interact with on this website care about me.
RELA4	The users I interact with on this website do not seem to like me.

RELA5	While using this website, I cannot relate to most of the users.
	MOTIVATION(Formative)
	Why do you use this website?
IM1	Because I think that this website is interesting
IR1	Because I am doing it for my own good
ER1	Because I am supposed to do it
AM1	There may be good reasons to use this website, but personally I don't see any
IM2	Because using this website is fun
IR2	Because It is my own decision to use it.
ER2	Because many people I know use it.
AM2	I don't know; I don't know what using this website brings me
IM3	Because I feel good when I use this website
AM3	I use this website but I am not sure if it is worth it
IR3	Because I believe that using this website is important for me
ER3	Because I feel that I have to use it
	INTENTION(Reflective)
INT1	I intend to continue using this website, rather than discontinue its use
INT2	I would like to discontinue using this website.
INT3	I intend to regularly use this website in the future
	ATTITUDE(Reflective)
ATT1	I like this website.
ATT2	I consider this to be a good website.
ATT3	I think this is a nice website.
	USE
	Approximately, how many times did you visit this website in the last month? Never() Once in the last month() Once a week () Two or Three times a week () Several Times a week() Once a day () Several times a day ()
	TENURE
	Approximately, how long have you been using this website? Less than a week(), One Month (), 1-6 months (), 6-12 months (), More than a year ()

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