Knowledge Sharing in Online Cancer Survivorship Community System: A Theoretical Framework

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ABSTRACT

Innovative uses of technology to support patient to patient or patient to clinician knowledge sharing are emerging through professional health institutions and communities that take advantage of social networking technologies. Although successful online health communities exist, many such communities do fail. Researchers have stated that the reason for these failures is due to the lack of evidence-based, scientific guidance in building and managing online communities. Knowledge sharing among participants is important for the survival of online health communities. The most difficult and challenging task for online health communities is to understand why certain participants share knowledge in a sustained manner while others do not. The purpose of this study is to identify the conditions that will predict and prescribe a successful online health community. We propose a theoretical model that presents computer self-efficacy, system capabilities, patient characteristics, appropriation support as determinants of knowledge sharing. We also propose that knowledge sharing affects satisfaction, and frequent usage of online health community networks within online cancer survivorship community.

Keywords

Online communities, offline and online communities, cancer online community, knowledge sharing and online community.

INTRODUCTION

The internet has revolutionized how individuals interact with each other, rather than just having access to information; a richer internet has emerged that includes collaborations, contributions and participation within online health and other communities (Thurlow, 2004). Shneiderman et al. (2009) believe that the role of technology mediated social participation within online health communities can address several national priorities especially enabling healthy living. The rapid growth of online health communities has enriched the online user's experience in delivering complicated and synchronized health information in a simple manner. Recent data showed that 80% of Americans have used online health communities to search for a major health topic (Pew, 2006). It has been claimed that 68% of Americans with chronic illness are more likely to blog about their disease and contribute to an online health community discussion forum seeking support, advice and knowledge (Pew, 2010). Currently there are over 20,000 health-related databases, of which some are online health communities (Sillence, Briggs, Harris, & Fishwick, 2007). Online communities consist of groups of participants that communicate by posting and reading messages on a community messages board over the internet. Participants join an online community conversation due to a shared interest in a hobby, political cause or health care issues (Preece, 2000). One of the first online communities was the Well, established in 1985 (Rheingold, 1993), which enabled users to post and share knowledge regarding variety of topics and discussions. Since then hundreds of new online communities and social networking sites have established themselves (Reid & Gray 2007). Some recent online health communities include WebMD which has several online health communities and includes cancer, depression and women's health. Other online health communities include the American Cancer Society cancer survivors' network which allows users to share cancer knowledge with peers for social support and the Anderson Network a cancer survivorship community from University of Texas MD Anderson Cancer Center (MDACC). Cancer is the leading cause of death by disease in the US, accounting for almost one out of every four deaths. It is expected that there will be over 1.5 million new cancer cases in 2012 (Elizabeth, Marcus, Lynn, & Brenda, 2012). Recent advancements in treatment and diagnosis at an early stage of many cancer types have greatly increased survivorship rates. The estimated 5 year cancer survivor rate has increased from 50% in 1975-1977 to 68% in 1999-2005 and these numbers are expected to continue to increase over time (Elizabeth et al., 2012). Cancer was once regarded as incurable disease, however is now becoming a controllable and manageable disease like diabetes (Arora, Rutten, Gustafson, Moser & Hawkins, 2007). In this research, cancer survivors refers to patient who have ever been diagnosed with cancer, which include patient in

treatment, or completed treatment, or dying from untreatable cancer (National Cancer Instiute, n.d.). Cancer survivors need to coup with their emotional turmoil made by their cancer which can include anxiety about disease recurrence, treatment options and side-effects, fear of death, concerns about social isolation and stigmatization (Anderson, Shapiro, Farrar, Crespin & Wells –Digregorio, 2005). Social support was shown as an effective in assisting cancer survivors reduce the physical and psychological hardship a cancer diagnose can bring on a patient (Anderson et al., 2004). Traditionally social support has been given or received in person however, with new technology such as online health cancer survivorship communities have allowed patients more options to connect in different ways. Different than face to face support group, online cancer survivorship communities provide major improvement in cancer survivor's quality of life, lower anxiety and depression (Lieberman et al., 2003), improved empowerment (Hoybye, Johansen, & Tjornoj Thomsen, 2005), increased perceived coping abilities (Harper, Chelf, Deshler, Hillman & Durazo-Aruzu, 2000).

Cancer survivorship online community members utilize request general knowledge about disease specific information, ask for advice from doctors, and interact with other patients with the same chronic disease about drug interactions, dosages, and side effects. The potential benefits of these online health communities include enhanced participant retention and automated lifestyle intervention and patient education about treatment and side effects. There are many of these health online communities that continue to exist and evolve today with consistent membership growth. Other online communities including health online communities are struggling to survive. However, it is still unclear why some online health communities become successful and others fail (Ye & Fischer 2007; Kraute et al., 2010). Web tools, such as Google Health and Microsoft Health Vault that help participants manage their health online have faced challenges. In addition, the novel idea from the PatientLikeMe.Com online health community had very low participation rates (Preece and Shneiderman, 2009). Thus, there is a need to understand how to predict and prescribe a successful online health community. There is a need to understand how technology mediated social participation/knowledge sharing works (Kraut, Maher, Olson, Malone, Pirolli, and Thomas, 2010). Kraute et al. recommended development of new social computing systems that are founded in scientific and evidence based research for managing online communities; the new research should consider investigating individual psychology and system capability and usability of systems. Thus, we attempt to explore factors that determine the survivorship of online health communities.

LITERATURE REVIEW AND THEORY DEVELOPMENT

In this research, we propose a theoretical model to identify the factors that predict and prescribe a successful online health community. More specifically, this study will investigate the impact of computer self-efficacy, system capabilities, demographics (age) disease factors (type of cancer and cancer stage), appropriation support (facilitator and training) on knowledge sharing and how knowledge sharing affects satisfaction, and frequent usage of online community within online cancer survivorship community. Although successful online health communities exist such as cancer survivorship; many such communities fail (Kraut, 2010). The causes of why some online communities fail while others become successful is complex and varied (Fang & Chiu, 2010; Ke & Hoadley, 2009; Schlager, Fusco, & Schank, 2002). Some researchers believe the cause can be due to the absence of evidence based scientific direction in managing online health communities (Shneiderman, 2009; Kraut, 2010). Researchers call for more studies to provide a better understanding of the reasons (why, how and when) online health communities become successful. There is also a need to investigate whether online health communities promote and support a patient's growth of new knowledge (Shneiderman, 2009; Schlager et al., 2009). When online health communities' fail, patients' decision making and health literacy are adversely affected (Neal, 2006; Maloney-Krichmar & Preece, 2002). Online health communities that fail have been also found to have less knowledge sharing and lack of sociability (lower number of participants, contributions such as the number of messages posted per period) and lack of usability (user satisfaction, user productivity) (Peerce, 2001). In addition, these online communities have difficult time fostering sustained knowledge sharing (Chiu, Hsu, & Wang, 2006 ; Prestridge, 2010). Information about the causes of these attributes is limited. It is necessary to conduct studies to identify the variables that determine the success of online health communities (Shneiderman, 2009). Pirolli, Preece, and Shneiderman (2010) further argued that understanding how variables interact to promote success which can lead to sustained knowledge sharing is necessary, since it will support and benefit the national initiative of social participation for healthy living and better social support systems. Prior research that examined the success factors of online communities have mainly focused on the relationship between offline to online communities (Borgatti, Mehra, Brass, & Labianca, 2009; Kleinberg, 2008); and social capital such as trust and norms (Burt, 2005). frequency usage (Ellison, Steinfield, & Lampe, 2007); and user satisfaction (Peerce, 2001). These studies, however, were deemed limited in addressing the human factor of knowledge sharing behavior within online health communities (Shneiderman, 2009) and the causal factors that contribute to successful online health communities. To address these limitations, additional studies and new models are needed.

That is why this proposed model will include computer self efficacy. Computer self efficacy as it has been shown to be a predictor of behavior intention (Bandura, 1989). The degrees of self-efficacy are measurable and allows for the predictability of individual's behavioral outcomes, such as technology acceptance and usage or training and learning outcome or performance, and other predictive factors (Benight & Bandura, 2004). System capability is also considered an important factor and researchers need to understand the usability and the type of system are best technology fit for online health communities systems (Dennis, 2001). Past studies have shown if system capability was not understood, usability can be affected negatively (HIMSS, 2009). Demographic factors such age and its relationship with knowledge sharing has been studied, however, the study did not consider how age impact cancer survivors within online communities (Andrew, 2004). Other researchers recommend further study of gender and age as both factors may be barriers to knowledge sharing (Sveiby & Simons, 2002). Disease factors (type of cancer and cancer stage) and appropriation support (facilitator and training) may further influence knowledge sharing. For example, Bower (2000) found some breast cancer patients tend to have mobility and fatigue problems, thus this can impact their knowledge sharing activities within online heath community. Furthermore, some brain cancer patients tend to show signs of depression/anxiety, antisocial behavior, while others do not (Carlson, Angen, Cullum, Goodey, Koopmans, Lamont, MacRae, Martin, Pelletier, Robinson, Simpson, Speca, Tillotson, & Bultz, 2004). In addition, the stage of cancer which describes the severity of a patients' cancer can have positive or negative impact on their knowledge sharing activities within online health communities. For example, if a patients' stage is high, the severity of cancer is high and the chance of recovery from the cancer is low (Greene, 2002). Gustafson, Hawkins, McTavish, Pingree, Chen, Volrathongchai, Stengle, Stewart, and Serlin (2008) stated there is a need to further study disease severity such as type of cancer and cancer stage and their impact on the utility of the internet. Another important factor is having a facilitator (leader) within an online health community who can positively influence the participants' knowledge sharing behavior. According to Dennis (2001), without adequate facilitator (leader), performance and knowledge sharing within an online community the system will not improve even if the there is a technology fit. The theoretical model proposed in this study relies on adaptive structuration theory (AST) (DeSanctis, 1994) and the fit appropriation model (Dennis, 2001). AST is based on Giddens (1976) structuration theory. DeSanctis & Poole (1994) modified Gidden's theory to concentrate on the mutual influence of technology and social processes. DeSanctis and Poole (1994) proposed the adaptive structration theory which suggests that "the social structures provided by an advanced information technology can be described in two ways: structural features of technology and the spirit of this feature set" (DeSantis and Poole, 1994, p.126) Structural features could mean bringing control and meaning to group interaction which supports the gathering, aggregation and synthesis of information. The spirit of the feature set is described as "the general intent with regard to values and goals" which can be identified from (a) design metaphor underlying the system; (b) features it incorporates and how they are named and presented; (c) the nature of user interface; (d) training material and on-line guidance material (DeSantcis and Poole 1994, p. 126). Dennis, et al (2001) used some elements of AST theory and developed a new theory that focuses on two areas: (a) the fit between the task and the system structure (e.g. communication support (asynchronous versus, synchronous) and information processing support (aggregate and evaluate information); (b) appropriation support (facilitator or leader within an online community). Little research has investigated what is required for an effective and sustained knowledge sharing within online cancer survivorship community. Sharing knowledge is often unnatural for people (Davenport, 1998). People are hesitant to share knowledge due the fear of losing superiority. This human nature demands further study and development of a predictive model that will lead to a successful online health community specifically online cancer survivorship community.

The current scientific literature identifies system capability as important factor for a successful online community; however, the literature lacks empirical evidence of the exact practices of effective system capabilities for a cancer survivorship online community. Similarly, computer self efficacy has been shown to have an association with technology acceptance and performance (Agarwal, Sambamurthy, & Stair, 2000) however, there is little empirical evidence that shows the impact of computer self-efficacy with system capabilities on knowledge sharing within an online community in healthcare. In addition, satisfaction, frequent usage, and disease factors are under studied in the context of these online communities. There is a need to understand the exact practices that assist knowledge sharing activity within online cancer survivorship communities, which will help both researchers and practitioners gain knowledge into the factors that stimulate knowledge sharing in the long term (Ardichvili, 2008). Ardichvili (2008) argued, even though factors that motivate participants to share knowledge have to come before knowledge sharing, it does not necessarily result in actual knowledge sharing activities. Thus, studies are needed to understand the factors that stimulate, sustain, and develop an association with knowledge sharing, which lead to successful online health community (Kraute et al., 2010; Shneiderman, 2009; Ardichvili, 2008). Therefore, the significance of the proposed study will provide evidence about the factors that influence knowledge sharing and lead to a successful online health community.

A PROPOSED MODEL FOR STUDYING ONLINE CANCER SURVIORSHIP COMMMUNITIES

In this research, we propose a theoretical model that presents the critical predictors such as computer self-efficacy, system capabilities, demographics (age) disease factors (type of cancer and cancer stage), appropriation support (facilitator and training) of knowledge sharing. The model also shows the consequences of knowledge sharing on satisfaction and frequency usage of an online cancer survivorship community.

Figure 1 below shows the dependent, independent and moderating variables in the proposed model of this study. The moderating variable is appropriation support. The dependent variables are usage of online community, knowledge sharing within an online community, satisfaction of the participants of the online community and self-efficacy in evaluating information and intention. As previously stated, the independent variables will be disease factors, computer self-efficacy, system capabilities, and demographic factors. We recognize AST theory discusses how new social structures and emergent sources of structures impact the use of the system; however, in this research study we are not adopting this feedback loop**.** The purpose of the study is to develop a deeper understanding of the practices that predict a successful online health community, specifically, an online cancer survivorship community. Next, we discuss the individual constructs of our research model.

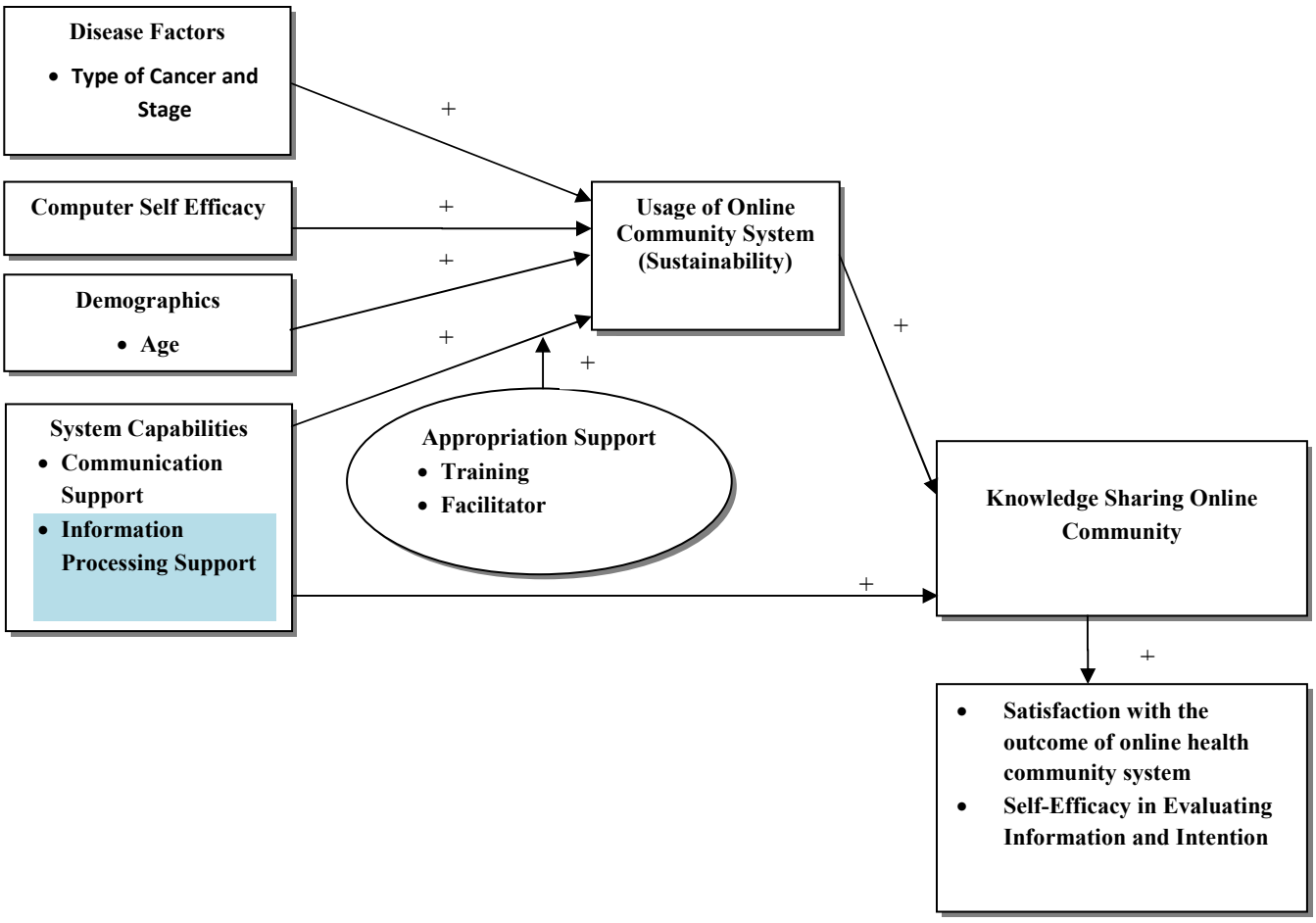

Figure 1. Research model demonstrating the relationships between variables of interest

Knowledge Sharing

Knowledge sharing fundamentally mean the generation of knowledge in the recipient (Van Beveren, 2002). With the current advances in internet technologies, knowledge sharing has leaped past physical community to online communities. Online communities have made knowledge sharing more efficient at both societal and global levels in new ways. For example, knowledge can be collected quickly from participant volunteers in Wikipedia. Currently, online communities have grown very rapidly over the years. There are some online communities that have millions of registered users from around the world (Heer, 2005). Researchers are struggling to understand the factors that motivate participants of an online community to share knowledge as there is a delicate balance between gaining knowledge and sharing knowledge. Prior studies have assessed the causes of sharing knowledge within online communities (Lee, Chen, & Jiang 2006**;** Hew & Hara 2007). In addition, other qualitative studies focused on factors such as trust (Hsu et al., 2007), reputation, commitment, and tenure (Wasko & Faraj 2005). Hew and Hara (2007) expanded the work of Batson, Ahmad, and Tsang (2002) and, investigated four categories of community participation motives that could clarify why participants are willing to share knowledge within an online community: (a) egoism (refers to enhance a participant's own benefit); (b) collectivism (enhances the group's benefit); (c) altruism (enhances the benefit of one or more other participants); and (d) principlism (to upload some type of moral principle like justice). Although the literature identified some motivations for knowledge sharing, there is a lack of studies examining ways that increase or take advantage of participant's ingrained or fixed motivations to contribute knowledge within online cancer survivorship communities. Moreover, despite the overall benefit of knowledge sharing within online health communities, sharing knowledge often considered an unnatural behavior for participants; however, hoarding knowledge and examining skeptically upon knowledge from others are considered a natural behavior (Davenport & Prusak 1998). Therefore, it is important to understand the factors that affect the decision to share knowledge within an online health community.

Frequency Of Use

Frequency of use of information systems has been studied in different ways. Researchers have looked at personal variables such as age and training as critical predictors of beliefs of usage frequency of information systems. For example, Aladwani (2001) found that age is negatively associated with the frequency of use of information systems while, Aladwani's (2001) study discovered training reduces computer anxiety and increases variety of use. Other researchers found several differences between young and old users in term of frequency of use (Pfeil, Arjan, & Zaphiris, 2009). For instance, in a review of the literature of system use and frequency of use a researcher stated "often researchers conceptualize post adoptive use of an IT application as increase (e.g. more use, greater frequency of use etc.) as individuals gain experience in using application." (Jasperson, Carter, & Zmud, 2005, p.527). In addition, Jasperson (2005) and others add "In reality post adoptive behaviors may also diminish over time due to several features being unaccepted and used in a partial way" (Jasperson et al., 2005, p.527). Thus, understanding these behaviors and factors that are associated with frequency of use is critical. Computer self-efficacy and capabilities of information systems influence users' inclination to use a system (Compeau & Higgins 1995). Thus, in this study we focus on these constructs and attempt to establish their relationships with knowledge sharing in online communities.

Demographic Factor (Age)

The fastest growing users of the internet in the United States are the older adults. A recent study in Japan by Do Site (2008) showed internet usage among older individuals was significantly higher in both 65-69 and 70-79 age groups between the periods 2003-2006. Jones and Fox (2009) estimated that individuals age 55 and above represent a quarter of the internet user population in the U.S. and their access to a faster internet connection (broadband) has more than doubled between 2005 and 2008. However, Fang and Yen (2006) observed that older individuals navigate their way on the internet with less ease compared to younger individuals. While younger individuals tend to use the internet to watch videos, download music, and play games (Jones & Fox, 2009); older individuals utilize the internet for health related and religious topics. Thus, we propose:

> **P1:** Age of the participants of online health community systems will have negative relationship with the frequency of use of these systems.

Computer Self-Efficacy

Derived from the broader construct of self-efficacy, computer self efficacy (CSE) has been defined as an "individual's perception of his or her ability to use a computer in accomplishment of a job task" (Compeau and Higgins 1995a, p.193) and "a judgment of one's capability" (Den, Doll, and Troung, 2004, p.395) to use a computer to accomplish a task". Marakas, Yi, and Johnson (1998) drew the distinction between task-specific CSE and general CSE. Task specific CSE is "what a person perceives their capabilities to be with regard to a specific task" (Marakas, et al., 1998 p.128). Task-specific CSE is similar to the original self-efficacy concept in that it focuses on an individual's perception of his or her capability to use a specific tool within a sub-domain, such as Databases, Window 7, or UNIX. The item "I believe I have the ability to use a spreadsheet to display numbers as graphs" is an example of task-specific CSE (Johnson and Marakas, 2000). In contrast, general CSE refers to "an individual's judgment of efficacy across multiple computer domains" (Marakas, et al. 1998, p. 129). General CSE is comprised of an accumulation of many task-specific CSE measures and thus is an attempt to understand the person's perception of his or her ability for all computing domains, rather than for a sub-domain (Downey & McMurtrey, 2007). An illustration of general CSE is study participants without prior experience with the software package being asked to "complete the job using the software package" (Compeau and Higgins, 1995a, p.384). According to Downey and McMurtrey, (2007), general CSE is a valuable theoretical construct because it integrates an individual's perception of his or her capabilities across a large amount of computing and application tasks. Several studies have investigated the relationships between self-efficacy construct and information technology as well as the affect that CSE has on the performance and use of information systems (Compeau & Higgins 1995). In particular, research has concentrated on the relationships between CSE and perceived usefulness and perceived ease of use of technology (Lopez & Manson, 1997). Others researchers have focused on training or computer experience (Wilfong, 2006). Still other studies concentrated on CSE and age (Chua, Chen & Wong, 1999; Lim, 2001), computer attitude and usage behavior (Compeau & Higgins, 1995a; Gist et al., 1989), and performance (Lim, 2001). CSE was found to have a negative relationship with anxiety (Igbaria & Iivari, 1995). Furthermore, Compeau & Higgins (1995), discovered that CSE has a positive relationship with outcome expectations, frequency usage, training, and system use. We expect that CSE has similar relationship with the use of online health community systems. When the participants perceive that they have the ability to use online cancer survivorship systems, they start using the system frequently. Thus, we propose:

> **P2:** Computer self efficacy (CSE) of the participants of online cancer survivorship communities will have positive relationship with the frequency of use of online health community systems.

System Capabilities

Zigurs and Buckland (1998) proposed that three types support that a group support system can offer. These are: (a) communication support (Synchronous/Asynchronous systems that supports or improves communication participants); (b) information processing support (supports the gathering, aggregation and synthesis of information); and (c) process structure (characterize the process by how the participants perform the task in most effective manner). Although process structuring may be necessary for online health community systems, we expect that common and information processing supports will have greater influence on the sharing of knowledge in these communities. This is due to the e-Patient revolution. The E-Patient revolution is " [a] fundamental reconfiguration of medical knowledge and expertise from online health communities, which is changing the roles of patients and clinicians." (Dreiss, 2007, Chapter Seven, para. 6). The term 'e-Patients' refer to individuals who gather information, aggregate information, evaluate information and structure information in an electronic format to gain and form knowledge. In certain situations, e-Patients may have more knowledge about or more understanding of some aspect of their disease than their clinicians (Dreiss, 2007).

Communication Support

The communication support provides one of the important pillars of a successful online community. Currently, a majority of online community systems utilize asynchronous or synchronous type of technology (Hrastinski, 2008). Asynchronous systems commonly facilitated by media such as blogs, email, wikis, and discussion boards (Hrastinski, 2008). In an asynchronous environment participants can contribute their idea without being dependent on other participants being there at the same time. On the contrary, a synchronous system involves media such as chat, videoconferencing where every participant would be online and work together at the same time (Hrastinski, 2008).

Researchers have presented three types of communications that are critical for the development and success of sustained e-learning communities and include: (a) content related communication (ability to ask questions about content, share knowledge, and articulate ideas); (b) planning of tasks communication(plan activities, delegate tasks, coordinate efforts and

solve issues); and (c) social support communication (emotional support, utilize emotions, discuss other issues beside main topic (Hrastinski, 2008)..

Robert and Dennise (2005) proposed a theory that stated online communication with asynchronous technology enhances a participant's capability to process information. In essence, the participant receiving the information has time to comprehend the message and is not required to respond immediately to the message. Thus the participant will most likely research the topic and post a more thorough response. Hrastinski (2007) conducted a study that compared synchronous to asynchronous e learning systems and found that majority of asynchronous discussions was labeled as content related type of communication. Synchronous type communication has been found to increase psychological arousal (ability to observe facial expressions, expectation of an immediate response to message) (Hrastinski, 2007). The behavior is due to the fact; synchronous communication is similar to having a real face to face conversation. In addition, other researchers found when using the cognitive model media choice with synchronous communication, motivation can be enhanced (Robert & Dennis, 2005). Furthermore, synchronous does support many more type of communication (i.e. content related, planning of tasks, social support) (Hrastinski , 2007). We expect that communication support will increase individual participant's propensity to use the online health community systems. We also expect that support for asynchronous communication will enable users to process the information acquired from online health community systems and will have a positive effect on the sharing of knowledge in online communities. Thus, we propose:

> **P3:** Communication support of online health community systems will have a positive relationship with the frequency of use of the systems.
>
> **P4:** Asynchronous communication support of online health community systems will have a positive relationship with the sharing of knowledge in these communities.

Information processing support

Information processing includes the support of aggregation, evaluating, development, and analysis of information (Dennis, 2001; Zigurs & Buckland, 1998). Information processing support assists groups to improve and comprehend the issues that are currently being discussed. In addition, it can show where there are agreements and disagreements about facts among the group discussion (DeSanctis & Gallupe, 1987). Moreover, it can create synergy and promote knowledge sharing and objective evaluation (Nunamaker, Dennis, Valacich, Vogel, & George, 1991). We expect that information processing support of online health systems will enable the participants to process the information gathered from these systems and generate knowledge from the processed information. Thus, we propose:

> **P5:** Information processing support of online health community systems will have a positive relationship with the sharing of knowledge in these communities.

Appropriation Support

Dennis et al's (2001) Fit Appropriation Model expanded the technology fit theory by integrating it with Adaptive Structuration Theory (DeSanctis and Poole 1994). The Fit Appropriation Model had two components: the fit between the technology and the task and appropriation constructs which refers to the process of how participants apply and adapt technology to their task. DeSanctis et al. introduced two types of appropriation: faithful and unfaithful. When participants utilize technology as it was intended by its designers then that is defined as faithful appropriation, however, unfaithful appropriation is where participants do not use the technology as intended by the designer (DeSanctis et al., 1994). However, Dennis et al. reports that even if you have the best technology fit with the task, this becomes futile when participants do not use the technology properly. Therefore, it is critical to investigate the types of support that technology provides to guide participants in the faithful use of the technology. Dennis et al. identified this as appropriation support such as training, and facilitation appropriation within a system where the technology system is being used as it intended. The proposed research will investigate the relationship between appropriation support (training and facilitation) and system capability has with the frequency of use of online systems.

Appropriation support (Training).

Appropriation training involves more than just how to use an existing structure (Wheeler and Valacich, 1996, p. 436). Specifically, appropriation training is analogous to the difference between how to access an online community to post a

message (technical training) versus knowing when and why and how much you should contribute/knowledge share within an online community. Prior research has shown appropriation support-like training and other factors can increase the likelihood of participants wanting to use the technology for the intended purpose (faithful use), thus improve decision quality (Denise et al., 2001; Wheeler & Valacich 1996; DeSanctis & Poole 1994). Appropriation training is often combined with facilitation, for example, Schwartz discussed developmental facilitation where facilitation was used to train the group in effective collaboration (Schwartz, 2002). I expect appropriation support (in the form of training) to bolster the positive relationship with system capability has with the frequency of use of online systems.

Appropriation Support (Facilitator).

Leadership is a form of valuable moderation or facilitation. In the knowledge sharing literature, leadership is viewed as essential in a successful online community (Dennis, 2001). Researchers have provided insight into four functions of a leader (facilitator): (a) organizational function that involves bringing together and managing the work of the group; (b) social function includes creating a pleasant and friendly environment that encourages participations; (c) intellectual function includes recap and compile the main points and produce a synthesizes of the main rising themes; (d) technological function involves understanding of the community type of system and tools being used and usability issues that arise when participants knowledge share within an online community (Gairin-Sallan, Rodrguez-Gomez, & Armengol-Asparo, 2010; Dennis, Wixom, & Vandenberg, 2001). Many studies focus explicitly on moderators and leadership. Gairin-Sallan et al. (2010) defined the characteristics of a moderator within online network. Dennis et al. (2001) expanded the work of DeSanctis et al. (1994) and identified leadership within an adaptive structuration theory is critical to the technology fit of online community system. These studies emphasize the important role of facilitators or moderators in the success of communities. Gray (2004) believes having a moderator who is familiar with the social, cultural, and organizational issues of some type of practice is critical to its sustainability and its evolution over the long term. Recent a study by Stephen, Christie, Flood, Golant, Rahn, Rennie, Speca, Taylor-Brown, & Turner, (2010) took offsite expert psycho-oncology counselors and trained them to facilitate an online support group. With practice over time, the researchers found that the counselors became effective facilitators within their online community. However, to our knowledge, there are no studies that show how the role of the leader changes over time once the online community was established or how a leader impacted participants' contribution/knowledge sharing within online cancer survivorship community. Appropriation support in the form of facilitation can help users to use different features of the online health community system effectively. We expect appropriation support (in the form of facilitation) to strengthen the positive relationships that systems capability has with the frequency of use of online systems. The moderating role of appropriation support has been proposed in prior literature (Dennis et at., 2001). Thus, we propose:

> **P3a:** Appropriation support (in the form of facilitation and training) will moderate the positive relationship of communication support with the frequency of use of the online health community system.

Disease Factors

Cancer is a broad term that includes over one hundred different types of cancer. Although the types of cancers may share similar etiologies, they have their own unique characteristics as well. Patients with the different cancer diagnoses may have similar symptoms; however, a singular symptom may not be experienced by all patients with the same cancer histology. Bower (2000) found some breast cancer patients experience lack of mobility and fatigue while other patients do not. Carlson (2004) study discovered some brain cancer patients experienced depression and anxiety. Moreover, there are some types of cancers that do not show any symptoms until the patient is in advanced stage (ACS, 2011). Kumor, Abbas, Fausto, Mitchell, (2010) found that early stage cervical cancer patients can experience no symptoms, however, advanced stage cervical cancer can experience loss of appetite, back pain, and fatigue. In addition, early stage prostate cancer patients experience no pain, while advanced stage patients experience more complications (Cruijsen-Koeter, Roobol, de Koning, Van der Kwast, Schroder, 2005). Variation in cancer symptoms within the same cancer phenotype (within and across stage of disease) and similarities across different cancer sites can have an impact on the knowledge sharing experience within online cancer survivorship community. A diagnosis of cancer can be a major stressful life experience. The character of the disease requires patients to learn about the sickness, make hard decisions regarding treatment, and cope with the consequences of the disease as well as the treatment. It has been shown that having relevant information help patients understand the disease but also facilitates patients' decision-making and coping (Cassileth, Volckmar, & Goodman, 1980). As reported by John Mendelsohn (2009), the former president of University of Texas MD Anderson Cancer Center, (UTMDA) "the five year survival rate for all forms of cancer combined has risen to 66 percent, more than double what it was 50 years ago"(p.1). This means cancer survivors are living longer with the disease, thus studying how knowledge sharing behavior within online cancer survivorship

can provide more insight into patients' decision making and coping. We expect that the severity of cancer (in terms of type and stage) will have positive effect on the frequency of use of online health community system. Patients suffering from an aggressive form of cancer (such as, brain cancer, lung cancer) and those who are in the advanced stage of cancer will try to gather information on the disease and its treatments and will use the system frequently. Thus, we propose:

> **P6:** The severity of cancer (expressed in terms of type and stage of cancer) will have a positive relationship with the frequency of use of online health community system.

Satisfaction

Satisfaction is defined as "an effective response with respect to the attainment of goals process outcomes; and the process by which the outcomes were attained" (Nabukenya, Bommel, & Proper, 2008, p. 228). In this study satisfaction process refers to an affective encouragement of the participant respect to the procedures and tools utilized within the online community (Briggs, Reinig, & Vreede, 2006). Satisfaction outcome means an effective encouragement of the participant with respect to what was accomplished and developed in the online community (Dennis et al., 2001). It is clear from past research that satisfaction is a multidimensional and subjective variable which has an impact on many factors. Researchers depended on satisfaction to measure information system success in the Information system field (Ives & Olson, 1984). Atack, Lucke and Chien (2008) developed an online patient education system that provided access to text and video and was adaptable to different languages, audio and vision preferences. The researchers performed usability and patient satisfaction on the system and observed that patients were mostly satisfied with the system. Patients were especially satisfied with the video media education. Another patient mentioned the content on the website was very informative, but recommended posted stories from other patients similar patient under study to develop relationship with the website system thus keep him or her returning. The researchers recommended further testing with a larger sample size. To augment this research, further studies should focus on the factors or features that would make patients want to contribute consistently. Satisfaction has also been used in group meetings studies. Facilitators have found group meetings satisfaction was a critical measure for the group meeting success (Niederman, Beise, & Beranek, 1996). In addition, other researchers found that low satisfaction can result in participants not returning to use the technology again (Reinig, Briggs, Sheperd, Yen & Nunamaker, 1995). This low satisfaction is a concern because past research has indicated that participants who find their experience with a particular technology as not satisfying they most likely will not use it in the future (Reinig et al., 2003) Furthermore, when people do not like a group gathering such as online community because of the technology used for that group gathering, people are less likely to use the same technology in the future, even if they knew that the technology would increase their productivity with the task (George, Easton, Nunamaker, & Northcraft, 1990). Therefore, it is important to understand and measure the factors that cause satisfaction with the process and outcome of an online health community. Usefulness and reliability of output of a group support system contribute to users' satisfaction with the outcome of group work (Paul, Seetharaman, and Ramamurthy, 2004). When users share knowledge that is useful and reliable, their satisfaction with the outcome of online health community system will improve, thus, we propose:

> **P7:** Knowledge sharing in online health community system will have a positive relationship with users' satisfaction with the outcome with the system.

Self-Efficacy in Evaluating Information and Intention

Self-efficacy in evaluating information and intention is described as "the individual's belief in their ability to evaluate the quality of the information that they receive, the qualifications of those providing it, and the intent of the requestor" (LaCoursiere, 2001, p. 10).The e-patients are becoming so capable of being medically competent from the knowledge gained accessing online health communities. For example, a patient may receive bad news of a rare cancer will join an online health community and investigate the disease. By searching the discussion list within the online health community, the patient discovers a cancer specialist in New York Columbia Presbyterian Medical Center who developed a new approach to accurately diagnose his rare tumor. After seeing this cancer specialist, the patient was then correctly diagnosed as gastrointestinal stromal tumor (GIST). The patient was then enrolled into a clinical trial and within 30 days his tumor has shrunk by 50 percent. Patients using these online health communities improve their self-efficacy, and sense of empowerment to communicate effectively with their care providers and make informed decisions about their treatments. This in turn may increase knowledge sharing within these online health communities and have a positive impact on health outcomes. Thus, we propose:

> **P8:** Knowledge sharing in online health community system will have a positive relationship with users' self-efficacy in evaluating information and intention.

DISCUSSION

This research will investigate the practices that predict a successful online health community, and specifically, an online cancer survivorship community. We will develop a theoretical model that evaluates computer self-efficacy, system capabilities, patient characteristics, appropriation support as determinants of frequency of usage of online health community networks. We also propose that frequency of usage of online health community network affects knowledge sharing which in its turn influences satisfaction of online cancer survivorship community. To test the proposed theoretical model, the study will be a questionnaire based survey as it will use existing instrument and reword some questions slightly to address the objective of the study. We will collect data on computer self-efficacy, system capabilities, appropriation support, frequency of use, knowledge sharing, and satisfaction using questionnaires which will be mailed to participants who have used or are currently using online cancer survivorship community network. The proposed theoretical model will develop an understanding of the exact practices that assist knowledge sharing activity within online cancer survivorship communities. This in turn will help both researchers and practitioners gain knowledge into the factors that stimulate, sustain and develop an association with knowledge sharing in the long term. This research will also provide practitioners and researchers insights into the most challenging task for online health communities; namely, understanding why certain participants share knowledge in a sustained manner while others do not.

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