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Information Systems and Healthcare XXXVI: Building and Maintaining Social Capital–Evidence from the Field

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Abstract:

This study investigates how social capital is built and maintained in a Hybrid Virtual Communities (HVC), that is, a group of people with shared interests who meet face-to-face to exchange information and knowledge or provide emotional support and also do so in a "virtual" or online environment. Past health-IS research has primarily focused on pure virtual environments; however, many communities entail face-to-face interactions as well. This research helps fill this void. Discourse analysis of virtual interactions, face-to-face (FTF) observations, and semi-structured interviews of a patient-oriented HVC were analyzed, providing rich descriptive data. Using the theoretical foundation of social capital, this article extends existing theory by combining Drentea and Moren-Cross's [2005] social support framework with Etzioni and Etzioni's [1999] aspects of community framework to better explain building and maintaining social capital in a HVC.

Keywords: Hybrid Virtual Communities, social support, social capital, off-line communities, online communities, health-IS

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I. INTRODUCTION

The use of information technology in conjunction with health-related issues has exploded in the last decade. Few health consumers remain merely passive patients, but often proactively seek information and support from a variety of sources [Altinkemer et al., 2006; Civan and Pratt, 2007]. Hybrid Virtual Communities (HVC) have emerged in which groups of people with shared interests meet in both face-to-face and virtual environments to exchange information, share interpersonal and pragmatic knowledge, coordinate activities, and provide emotional support. Some assert that "rather than replacing face-to-face (FTF) contact, computer mediated communication (CMC) adds to it, filling gaps between the fuller range of information and emotion in interpersonal encounters" [Wellman, 2005, p. 54]. Others caution that time spent on the Internet can cause individuals to retreat into an artificial world, thus decreasing social capital [Nie et al., 2002; Di Maggioet al., 2001]. Social capital has been linked with better health [House et al., 2001], greater knowledge sharing [Robert et al., 2008], improved socio-economic outcomes [Sabatini, 2009], and enhanced life satisfaction [Kuo et al., 2008]. However, it remains unclear whether virtual interactions via the Internet augment or decrease social capital [Eastin and LaRose, 2005] or what types of exchanges take place in these settings.

While some work has examined hybrid communities [e.g., Nguyen et al., 2006], most healthcare related research examines social capital in either purely virtual (online) or totally FTF (off-line) environments. Social capital formation and maintenance is different in virtual environments than it is in ones where members also have a "real world" relationships [Hopkins et al., 2004]. Specifically, there is a paucity of investigation of patient-to-patient health related HVCs. While membership in a particular community is optional, patient-to-patient communities are potentially different than other communities (e.g., leisure or professional) because participants do not have volitional control of whether they are diagnosed with a disease. Social support is especially important for individuals with chronic disease [Looman, 2004].

This study significantly contributes to the health-IS research literature in several ways. First, this study addresses the gap in the literature by investigating how social capital can be built and maintained in a patient community that is neither solely virtual nor purely face-to-face. Specifically, this research investigates how social capital is fostered in a HVC of individuals diagnosed with Multiple Sclerosis (MS). While a great amount of research has focused on communities that are either FTF or virtual, hybrid communities have been under investigated in health-IS research. Next, by drawing on the theoretical foundation of social capital [Jacobs, 1960], a second major contribution is the creation of a new framework which combines Drentea and Moren-Cross's [2005] social support framework and Etzioni and Etzioni's [1999] aspects of community. For each community dimension, this research describes how social support can be built and maintained when individuals interact both FTF and virtually. This framework provides insight and can be used as a building block for future research in explaining how information technology assists in social capital development and enhances HVC functioning. Third, implications for healthcare-related practitioner groups are provided. As the population in the United States ages, healthcare issues are becoming increasingly important. This research suggests that fairly inexpensive CMC methods (such as e-mail) can be added to FTF health-related communities to augment positive outcomes.

The remainder of this article is laid out as follows. The next section discusses the theoretical foundations of Social Capital and Social Support and Communities. This is followed by a presentation of the methods used and the details of the case of a Multiple Sclerosis Aquatics Group. The group's interactions are analyzed and discussed using the proposed framework. Finally, research and practical implications are provided.

II. THEORETICAL BACKGROUND

Social Capital and Social Support

Social capital is a social science concept used in a variety of disciplines, including information systems, organizational behavior, public health, economics, and sociology that refers to connections within and between social networks. Value created in communities can be viewed through the lens of Social Capital Theory, whose modern roots can be traced to Jacobs [1960]. *Social capital* has been defined as "the sum of the actual and potential resources embedded within, available through, and derived from the network of relationships possessed by an individual or social unit" [Nahapiet, and Ghoshal, 1998, p. 243]. In regards to a health-related community, resources might include (but are not limited to) members' experiences with medications or delivery mechanisms (e.g., like an auto-injection device for self-administered shots) or contacts with "friends of friends" who have similar medical

issues. Social capital views communication as a principal way in which people assess who to help, trust, and engage with in reciprocal networks [Radin, 2006]. However, the social environment is critical to social capital formation [Coleman, 1990]. Thus, the processes for building and maintaining social capital in a health-related HVC may be different than those in which the social environment is either totally FTF or purely virtual.

Nahapiet, and Ghoshal [1998] argued that key elements of social capital exist when individuals are motivated to create or exchange knowledge, there are structural links between individuals, they have the cognitive capacity to understand, and their relationships have positive characteristics. Thus, the extent to which interpersonal knowledge sharing occurs is greatly influence by social capital [Chiu et al., 2006; Wasko and Faraj, 2005; Roberts et al., 2008]. While other forms of capital are financial or asset based, social capital is built on the interrelationships between people and their connections to their communities. It includes relationships between friends, neighbors, relatives, or co-workers who supply social support, including companionship, information, and a sense of belonging [Wellman and Frank, 2001].

Social support exchanges have been found to create social capital [Laser and Leibowitz, 2009]. Social support is defined as interpersonal transactions that include affect, affirmation, and/or aid [House and Wells, 1981]. It incorporates having others listen and show concern for one's problems, as well as receiving and providing advice and useful suggestions to difficult problems [Deeter-Schmelz and Ramsey, 1997]. Drentea and Moren-Cross [2005] found support for three categories of social support exchanges which created social capital: (a) community building/protection, (b) emotional, and (c) instrumental. In their study of a community of new mothers, community building/protection focused on organizing the community and establishing and upholding norms. Emotional support provided a caring and encouraging environment in which others could empathize and be a sounding board to the difficulties of becoming a new mother. Instrumental support was in the form of information sharing. Some research labels instrumental exchanges as the trading of goods and services and separates this from the exchange of information [e.g., Laser and Leibowitz, 2009]. However, in a virtual environment, physical exchanges are more difficult, and, therefore, information is highly valued and more frequently exchanged. In Drentea and Moren-Cross's [2005] work, some of the more common instrumental exchanges were related to information about pregnancy symptoms, breastfeeding, infant sleeping patterns, and colic. In these cases, these types of social support helped mitigate the stress of these mothers and provided valuable information regarding the care of their children.

While Drentea and Moren-Cross [2005] found support for the creation of social capital through Internet-based communities, some researchers disagree on whether time spent on the Internet leads to social isolation or social capital [e.g., DiMaggio et al., 2001; Nie et al., 2002]. Certain evidence shows time displacement, meaning users will displace face-to-face interaction, leading to a decrease in socializing within and outside the home. However, Wellman [2005] argues that participation in virtual communities will complement, rather than replace, face-to-face (FTF) interactions. Ridings et al. [2006] state that the desire to give and receive social support is an important motivator in the participation in virtual communities.

Much of the current healthcare research using social capital theory has been done in FTF *or* virtual environments, but not in hybrid environments that contain both types of interactions. In completely FTF environments, healthcare research of social capital creation and maintenance has primarily involved interactions between healthcare providers and patients rather than patient-to-patient based communities [e.g., Ahern and Hendryx, 2003]. In a wholly virtual environment, a significant amount of research has also been done. For example, Radin [2006] used communications medium theory and social capital theory when studying a breast cancer online support group and found that "thick trust" was developed as members shared their experiences and fears. (For other studies, see Eysenbach et al.'s [2004] review of health-related virtual communities and electronic support groups). The present research, however, investigates the creation of social capital in a patient hybrid community with both FTF and virtual interactions. The next section describes communities in general and further differentiates between virtual and Hybrid Virtual Communities.

Communities

A community can be described as a group in which individuals come together based on a common purpose, obligation, or interest [Rothaermel and Sugiyama, 2001]. It is not a group of individuals that simply have chains of one-on-one relationships, but rather, have relationships that "crisscross" and reinforce one another. To be considered a community, members must have some level of common values, meanings, and shared historical identity [Etzioni and Etzioni, 1999]. Prior healthcare research has found that FTF patient support groups produce positive outcomes such as increased individual responsibility for disease management [Arthur and Edwards, 2005], fewer psychiatric symptoms [Simpson et. al., 2001], and emotional assistance [Guidry et al., 2007].

More recently, research has focused on *virtual* communities in the health-related literature and has found that online patient-to-patient forums are often valuable sources of healthcare information [e.g., Donelle and Hoffman-Goetz,

2009].Virtual communities, where individuals come together through an electronic communication medium not bound by space and time, have been popularized by the Internet. In just the category of healthcare alone, Yahoo groups listed over 100,000 entries. While not all may meet the definition of a virtual community, this provides an indication of popularity of environments where people meet virtually to share ideas and interact. These communities are socio-technical systems that evolve and become more complex over time [de Moora and Weigand, 2007; Koh et al., 2007].

Some patients prefer to ask questions in a patient-oriented virtual community because discussions with healthcare professionals might be viewed as intimating whereas patient-to-patient interactions are considered less threatening [Scola-Streckenbach, 2008]. Certain community members may act as "expert intermediaries" in explaining scientific studies or complex information to others [Feldman-Stewart et al., 2007]. However, evaluation of information posted in terms of accuracy and quality remains a challenge. In addition, filtering irrelevant or personal posts can be time consuming [Burnett and Buerkle, 2004].

Virtual communities provide considerable flexibility in terms of participation and anonymity [Burnett and Buerkle, 2004]. Participation in virtual communities are adaptable in terms of both availability options and degree of involvement. Purely virtual environments are available twenty-four hours a day, seven days a week. Members can choose their level of participation by asking or answering detailed or broad-based questions, or by only reading others' posts. A member's level of involvement can shift from time to time or from topic to topic. Anonymity in a virtual community has both positive and negative aspects. Not having to reveal their "real" name can free individuals to ask questions or disclose information that they might otherwise not feel comfortable sharing. It protects a person's privacy. However, anonymity can also be negative because it can allow deliberate misrepresentations. For example, individuals can mislead others by pretending to have the group's shared illness, but are not personally afflicted themselves. They intentionally divert the focus of the group onto themselves [Burnett and Buerkle, 2004].

Virtual communities may be thought of as open and supportive. However, some research has found that some communities exhibit a fair amount of criticism toward certain types of opinions. While virtual communities may purport to be safe places to raise alternate opinions, members may be rebuked if they express unpopular viewpoints [Rier, 2007].

While many health researchers have focused on "purely virtual" communities, there has been scant research on hybrid environments in which group members meet both face-to-face (FTF) as well as virtually. Koh and Kim [2003] note that in some communities, members participate in "off-line" as well as "on-line" interactions. They found that off-line activities can mitigate the low social presence intrinsic in most computer-mediated environments and enhance members' sense of virtual community. Hybrid communities merge physical and virtual realms, resulting in a community that is neither wholly virtual nor completely physical. For instance, when examining HIV and gay communities, interchanges were found between these environments [Simon Rosser et al., 2008]. Community members, while online, shared popular or desirable places to meet FTF. However, in this particular case because of the health hazards, online participation was increasing while FTF groups were actually declining.

Different combinations of hybrid communities can be easily envisioned. For example, in the healthcare setting, a quarterly meeting for a patient community which reviews the latest research on disease management can be held solely in a FTF environment but also could be followed by, or entirely substituted with, online presentation and discussion. Fiol and O'Connor [2005, p. 20] discuss hybrid environments and define the "degree of virtualness" as the extent of face-to-face contact among members, which encompasses the amount as well as the frequency of contact. Others discuss off-line activities (e.g., informal or community based meetings) versus online interactions [Koh and Kim, 2003].

Aspects of Communities

Etzioni and Etzioni [1999] discuss six aspects of communities and suggest that hybrid communities allow the unique strong points of each environment to make up for weaknesses of the other. An objective of the present research is to evaluate the degree to which CMC used in virtual interactions enhances FTF communications in building and maintaining social capital within each aspect of community. The theoretical framework of these six aspects of communities proposed by Etzoni and Etzoni [1999] are briefly discussed below:

1. *Access*—defined as "the ability to communicate, not in the sense of articulating a message but in the sense of being able to reach others" [Etzioni and Etzioni, 1999, p. 242]. Having a mobile phone provides the ability and infrastructure to communicate, but does not guarantee that the owner will call others or that s/he will answer when the phone rings. Computer-mediated communications (CMC) has the advantage of enabling communication access to a large number of individuals across wide geographical areas and social

situations. For example, an individual who is homebound because of illness or disabilities may be able to access an online community via e-mail or a Web forum even though attending FTF meetings is not possible.

2. *Encompassing interpersonal knowledge*—a key element of community requires a high level of encompassing (versus specific) knowledge of the others so that bonding will occur, thus enabling the formation of a community [Talcott, 1951]. To gain encompassing knowledge of another, three elements are essential: identification, authentication, and accountability [Etzioni and Etzioni, 1999]. (a) Identification—In FTF communication, especially in smaller community groups, it is not difficult for members to gain knowledge of another's identity and compose mental descriptions of others. Even in larger groups, one can ask a friend or colleague about another individual, thus gaining clues to his/her identity. However, in CMC, user ids or avatars are typically used instead of names. Thus, one is never sure whether role playing or misrepresentation is being used [Adrian, 2008]; (b) Authentication—deals with trusting that "the communications from others are crudely correct, which often entails finding some way to authenticate some of the messages" [Etzioni and Etzioni, 1999, p. 243]; (c) Accountability—involves believing that group members are reasonably responsible. These three elements provide community members with broad, encompassing interpersonal knowledge of others which are essential in the formation of trust and community bonding.
3. *Interactive broadcasting*—To develop and maintain ties and values, communities must be able to broadcast messages to many members simultaneously. However, they must also allow the recipients of these messages to provide communal feedback. In this way, the crisscross bonding that characterizes communities is formed. If only point-to-point communications occur, interpersonal bonding (e.g., individual friendships) may develop but community development will be hampered.
4. *Memory*—"the process of sharing value draws on a prior sharing of history, communal identity, experiences, and rituals. Hence, there is the need for a communal memory" [Etzioni and Etzioni, 1999, p. 246], In FTF communities, mechanisms such as oral histories, archival records, and meeting minutes are often vague, incomplete or subject to errors. However, they are important for forming a shared culture based on past experiences. CMC systems enhance human memory by providing a more thorough and accurate mechanism for memory storage and recall [Kanayama, 2003]. Having the capability of accessing particular data through keyword searches reduces the retrieval time and improves the comprehensiveness of results. Thus CMC aids in memory access, storage, and recall.
5. *Breakout and reassemble*—The larger the community, the more difficult it becomes for members to bond, sustain common values, or actively engage in conversations. Thus, many large community groups provide occasions for breakout sessions, in which members meet in smaller groups and sometimes have the opportunity to share their conclusions when the larger group is reassembled. An example is a task force commissioned by a large advisory board that works on a specific issue but reports back to the group as a whole.
6. *Cooling-off mechanisms and civility*—may help circumvent the loss of civility and the rise in emotions resulting from heated arguments. Cooling-off mechanisms provide delay loops, including time intervals between receiving a message and sending a response. FTF community groups have informal delay loops because of informal communication, gossip, and the possibility that decisions might be delayed from one meeting to the next. In CMC system, such as interactive forums, "flaming" constitutes a lack of civility, but other types of asynchronous communications can provide a needed cooling period.

Summary

This research seeks to gain a deeper understanding of how each aspect of community, as discussed above, can be enhanced by CMC for the purpose of facilitating social support exchanges in a health-related HVC. Previous healthcare research that investigated social support development did so primarily in FTF *or* virtual communities. This research combines existing social support [Drentea and Moren-Cross, 2005] and community aspects [Etzioni and Etzioni, 1999] frameworks, to provide theoretically-based insights into a health-related environment that includes both FTF and virtual interactions. Analysis of social support creation and maintenance in a hybrid context was missing in previous IS-health research.

III. METHODS

A case-based strategy was used to examine social support exchanges and communities aspects in a face-to-face multiple sclerosis aquatics group and their virtual interactions. All research strategies have strengths and weaknesses. While qualitative case studies provide in-depth rich insights, they do so at the expense of larger sample sizes and greater generalizability [McGrath, 1992]. In this research, semi-structured interviews of current and former members, observation, and discourse analysis were used to collect data. The MS aquatics group meets for one hour three times a week for exercise, however, these sessions were observed only once a week. The

investigation included analysis of six months of e-mail dialogues between members; 118 e-mails were analyzed in total. In addition, nineteen semi-structured interviews were conducted. Three of the regular attendees were not interviewed because they did not have MS. Each interview lasted from twenty to forty minutes and was tape recorded and transcribed.

To help ensure the validity and reliability of the assessments made, a case study protocol was established [Yin, 1994]. The protocol includes a case study database that consists of case study notes, case study documents, tabular materials, and a case study narrative. The database created in this research consists of the case study written notes and transcribed interviews, narrative set of answers to each question asked in the interviews, the collection of e-mails encompassing six months, and tables of evidence by interviewee and e-mail dialogue.

The Case of a Multiple Sclerosis Patients' Aquatics Group

Both healthcare providers and healthcare recipients, such as individuals with MS, are utilizing technology in new and creative ways. MS is a degenerative autoimmune disease that affects the central nervous system. Because of this, MS patients, along with other autoimmune diseases or aging in general, may develop problems (e.g., inability to walk or drive) that make it more challenging to get out and socialize in FTF settings. MS patients also may have symptoms that make interaction with computers more difficult (e.g., double vision or hand tremors). Thus, the virtual component of interactions can be very important, but can also be laden with difficulties. Therefore, this is an interesting and relevant group in which to examine both FTF and CMC interactions.

The MS Aquatics group is sponsored by the Lone Star Chapter of the National Multiple Sclerosis Society, located in the United States in Fort Worth, Texas. The chapter was founded in 1955 to provide direct services to people affected by MS and is the largest chapter in terms of geography, population served, and monies raised. The class is provided as a free service to MS patients. FTF exercise classes are instructor-led and are held during the regular school year three times a week, lasting one hour each session. Attendance averages twelve individuals per session, but ranges from six to eighteen. The group also communicates virtually through e-mail. When a newcomer joins the group, personal information, such as name, address, phone number, birthday, and e-mail address, is distributed to the members.

Eighty-nine percent of the group is female. This is not surprising because MS predominately attacks women. MS is usually not diagnosed until an individual reaches adulthood. In this group, the average age was somewhat older, 54. Only two members are single. More than half of the group retains the ability to walk with little (cane only) or no assistive devices; 32 percent used walkers; 10 percent wheelchairs/scooters. Seventy-four percent are still able to drive (some with hand controls); 26 percent no longer drive. Driving and/or having transportation to the FTF meetings is a major issue for many of those who no longer drive (see Table 1).

Table 1: Demographics of Interviewees

GENDER	89% female 11% male
AVERAGE AGE	54
MARITAL STATUS	89% married 11% single
MOBILITY DEVICES	10% wheelchair/scooter 21% cane 32% walker 37% none
ABLE TO DRIVE?	74% yes 26% no

At the beginning of each exercise session, the group walks in various prescribed ways back and forth across the seventy-five-foot width of the pool (e.g., walking, placing heels together, etc.). During this time, groups of three to five people often carry on informal conversations. After about ten minutes, the entire group forms a large circle where new people are introduced and announcements are made. When there is a new attendee, everyone in the group introduces him/herself by first name. Announcements can be made by any member of the group on any subject that h/she deems appropriate for the entire group. If there are no formal announcements, the instructor might ask a question, such as, "What is your favorite Thanksgiving dessert?" At the conclusion of "circle time," which typically lasts five to ten minutes, everyone moves to the perimeter of the pool to perform the remaining exercises. During this time, conversations can occur, typically between people adjacent to each other at the edge of the pool.

Once a month, after class, the group meets together for a "potluck" lunch; each person brings a dish to share with the others. Occasionally after the meal there will be an outside speaker who addresses topics of interest to the group such as stem cell research or nutrition. On these days, pictures are often taken for a yearly calendar. A theme is given for each picture session, in which members dress up or wear hats according to the theme (e.g., Halloween). While the group is very social during class, there is little FTF interaction outside of the official class meetings. The out-of-class interaction that occurs is predominately via CMC.

Virtual interactions take place by e-mail. There is no prescribed pattern as to the frequency of interaction. During the six-month period, 118 e-mails were sent. Seven was the maximum number of e-mails sent on a given day and zero the least, averaging 1.55 e-mails per day. Any member can send an e-mail to one or more members of the group. However, one individual is thought of as the informal leader of the group, and is usually the one who sends reminders of schedule changes or special events.

IV. ANALYSIS

To analyze the interactions of this HVC, discourse analysis was used. Discourse analysis is a method for analyzing written or spoken language that is used a variety of social science disciplines, including sociology, anthropology, cognitive psychology, and communication studies [Brown and Yule, 1983]. The discourses were defined in terms of a coherent sequence of sentences. The virtual interactions were first classified by Drentea and Moren-Cross's [2005] categories of social support: Community Building/Protection, Emotional Support, and Instrumental Support. Next, both the face-to-face and virtual interactions were classified according to Etzioni and Etzioni's [1999] categorization of aspects of community. A new framework was created which viewed community aspects by social support categories. This framework was then used to identify the degree to which each aspect of community was enhanced by CMC and what type of social support fostered social capital (see Table 3). Using a descriptive framework to organize qualitative data is one of several approaches suggested by Yin [2003].

It was thought that further differentiation could be made based upon the content of the exchanges. Therefore, a technique called *open coding* was used in which the discourses were further categorized into concepts that had no preexisting labels [Strauss and Corbin, 1968]. The dialogue exchanges were iteratively read, and those with similar content were grouped together. Emotional Support exchanges were further classified as personal, inspirational, or humorous. Instrumental exchanges were further identified as health or non-health related. The quantitative results of the social support discourse analysis of e-mails are shown in Table 2, followed by a brief discussion of each category.

Table 2: Virtual CMC Exchanges by Social Support Category

	Community Building/ Protection	Emotional Support			Instrumental	
Type	**Community Activities**	**Personal**	**Inspirational**	**Humorous**	**Health-Related**	**Non-Health-Related**
Frequency	13	22	36	27	7	13
Percentage	11%	19%	31%	23%	6%	11%

Community Building/Protection

Knowledge exchanged in the community building/protection category was pragmatic knowledge [Alavi and Leiderner, 2002] and revolved around ensuring that all members were informed of the schedule and special events that occur. Thus, this type of explicit knowledge was immediately useful to community members. Community building announcements were usually made orally during the "circle time" in FTF meetings. However, e-mails were often sent, in addition to the in-class announcements. An example of this type of e-mail is:

> Due to Tommy leaving town for about a month - :(- we'll be doing Sept. pictures 9/13!! Please make note of this date!! We'll be reminding you in class, but make a note anyway!! :)

In a purely virtual community, such as the one studied by Drentea and Moren-Cross's [2005] community building/protection focuses on organizing the community and establishing and upholding norms. This is consistent with the e-mails sent in this study.

Emotional Support

Of the e-mail dialogues between community members, emotional support was the most prevalent type of interaction. Emotional support provides an encouraging environment that fosters hope and cheer and often gives comfort or

empathy. In these data, the knowledge exchanged was social, and could be categorized into three subtypes: personal, inspirational, and humorous. In terms of personal emotional support, members wrote about frustrations, stresses, or concerns about themselves and family members. For example, one e-mail stated:

> Dear friends, I am writing to let you know my mother passed away Mon. evening the 13th. She went to the ER Sat. night with pneumonia, but was improving Mon. morning, and the Dr. talked about her going home in a few days. Lori and I were with her till about 4:30PM Mon., and then went home. She was smiling and joking around a little with us before we left….. I know all of you have known how hard a time I have had trying to take care of her all these years, and I appreciate your listening to me and your prayers and helpful advice. …Thank you all again for being my friend and I love you all.

Two other subtypes of emotional support were inspirational and humorous exchanges. These discourses tended to be forwarded from other sources. For an example, an inspirational e-mail was forwarded containing pictures and music regarding the sacrifice our troops make, along with encouragement to honor them. Inspirational stories specific to those with disabilities were also sent. Humorous e-mails were general in nature, but provided emotional support, causing chuckles and smiles.

Instrumental

Explicit knowledge related to drugs, diet, or other health-related concerns was exchanged via e-mail in only about 6 percent of the e-mail interactions. One possible explanation of the low frequency of these exchanges is that much of this type knowledge was shared in FTF interactions, either at “circle time” for major announcements like new research reports, or in informal conversations. The e-mail interactions tended to provide follow-up or additional details of what was exchanged in the FTF environment. In addition, all of the interviewees had been diagnosed with MS for at least a year. One interviewee explained that immediately after diagnosis there was an initial flurry of information seeking. However, unless something was new, it did not generate much additional search activity. An example of a health-related exchange follows:

> Some of you were at the Dr S--- event. She talked about the importance of eating “color”, eating “raw” (unprocessed), eating organic and eating to keep a healthy PH balance. The following charts are an agricultural study showing how the mineral contents in organic fruits and veggies are so much higher than non-organic and what food to eat to keep a healthily PH balance (the foods in green keep your PH a healthy alkaline state).

E-mails not related to health issues contained knowledge that the sender felt would be useful to others in the community. These could be further categorized into general news (including links to websites or videos), interesting historical facts, merchandise (e.g., free t-shirts), and computer-related issues (such as virus alerts). An example of the first category is:

> This is shocking! A family in Memphis Tennessee had to have their 5-year old German Shepherd dog put down due to liver failure. The dog was completely healthy until a few weeks ago, so they had a necropsy done to see what the cause was. The liver levels were unbelievable, as if the dog had ingested poison of some kind! ….They started going through all the items in the house. When they got to the [cleaning product], they noticed, in very tiny print, a warning which stated “may be harmful to small children and animals.” They called the company to ask what the contents of the cleaning agent are and was astounded to find out that antifreeze is one of the ingredients…. therefore just by the dog walking on the floor cleaned with the solution, then licking its own paws, it ingested enough of the solution to destroy its liver. ….This is equally harmfully to babies and small children that play on the floor and put their fingers in their mouths a lot.

Virtual Enhancement of Community Aspects

The next phase of analysis classified face-to-face and virtual interactions and segments from interview transcripts according to Etzioni and Etzioni’s [1999] categorization of community aspects. Within each aspect of community, the social support category was identified. Thus, a new framework was created which viewed community aspects and social support categories present in this research, as shown in Table 3. The FTF column describes a key characteristic of the FTF environments for each aspect of community. The CMC column describes how CMC communications enhance that aspect of community above and beyond the FTF sessions. The last column in Table 3 provides an assessment of degree to which that aspect of community was enhanced by virtual CMC interactions.

Most of the aspects of communities as identified by Etzioni and Etzioni [1999] are applicable to the Community Building/Protection social support category which focuses on organizing the community and establishing and

maintaining norms. Some of the aspects are relevant to more than one social support category as noted in Table 3. The data provide evidence that virtual CMCs enhances some aspects of FTF communities, but does little to enhance others. Table 3 provides a summary, which is discussed below.

Table 3: Computer Mediated Communication Enhancement of Face-to-Face Sessions

Community Aspect	Social Support Category	FTF	CMC	Degree of Community Enhancement by CMC
Access	Community Building/ Protection	Limited by physical capabilities of attending sessions	Allowed participation regardless of geographical boundaries or physical disabilities	High
Encompassing Interpersonal Knowledge: Identification, Authentication, & Accountability	Community Building/ Protection	Obtained by first-hand assessment of individuals	Provided another mechanism for identifying individuals with the group	Low
	Emotional	Revelation of person circumstances.	Afforded "spur of the moment" or immediate communication	Medium
Interactive Broadcasting	Community Building/ Protection	Group announcements	Supplied schedule or community information to entire group regardless of physical attendance at sessions	High
	Emotional	Group encouragement and humor	Offered a mechanism to forward inspirational or humorous content	High
	Instrumental	Sharing of medical and non-medical information	Typically provided more detailed information than was originally shared FTF	High
Memory	Community Building/ Protection	Oral history	Allowed electronic search capabilities and reminders	High
	Emotional	Recollection of past friends and support	Facilitated a reviewable history	Medium
	Instrumental	Reminders of information previously shared	Provided search capabilities for information	High
Break out and Reassemble	Emotional	Smaller group conversations. Group interaction	Allowed side dialogues	Medium
	Instrumental	Sharing of information specific to particular individuals	Afforded smaller group work prior to sharing with entire group	Medium
Cooling Off Mechanisms and Civility				

Access

A weakness of exclusively FTF communities is that they are limited by geography and the physical capabilities of members in attending sessions. One member explained in an interview that she no longer was able to attend the FTF sessions on a regular basis because her ability to drive had diminished. Her access to the community was greatly enhanced by virtual interactions. She stated, "Yeah, it [the virtual interactions] helped me feel like I'm still part of the group." Another member who had moved to a different state remains on the e-mail list. She still participates virtually by sending e-mails containing jokes and other types of information. When asked whether she still felt a part of the group she exclaimed, "Oh yes!" Thus, CMC is highly instrumental to enhancing access in this HVC.

Encompassing Interpersonal Knowledge

Two types of social support were associated with this aspect of community: community building/protection and emotional support. The process of community building began in the FTF environment when new attendees were introduced in "circle time." Associating a "name with a face" provided the initial formation of personal identity knowledge. Thus, identification of individuals and the initial formation of encompassing interpersonal knowledge occurred in the FTF environment. The commonality of circumstances was key in the formation of the community. One interviewee stated, "It's good to be with other people who share similar problems and understand the limitations." In terms of CMCs, because this particular HVC uses virtual e-mail interactions in lieu of forums or chat rooms, members can feel fairly confident about each other's identities despite the fact that e-mail addresses aren't necessarily reflective of names. Thus, authentication of individuals' identities did not appear to be an issue in this HVC, whereas in a purely virtual environment, there might be greater concerns. Thus, enhancement via community building/protection in a CMC environment above and beyond that of FTF was low.

In terms of emotional support, in the FTF environment, members were able to reveal personal information and offer encouragement to others. During the FTF class meetings, members would talk about their children and grandchildren, vacations, daily activities, etc. If someone had been away, they were greeted by the others shouting out his/her name and lots of smiles or cheering.

CMC was also used for accountability and for providing emotional support. For example, one interviewee stated:

> If I haven't been for a while [to FTF class], she'll [Person A] send me a little e-mail, "been missing you at the pool, hope everything is okay," and that makes me feel good --to know that, you know, that somebody notices that that I am not there. That cheers me up.

CMC exchanges sometimes revealed personal information as well as requesting and receiving emotional support. For example, one e-mail read:

> Please pray for my father. He will have surgery the 18th for breast cancer. He's doing fine & handling things pretty well. My brother lives next door to my parents, so he & my sister-in-law will do what they need to do for my mom when he can't, but just pray they've caught this early!! Thanks!!

On the whole, however, most of the encompassing interpersonal knowledge was garnered in the FTF environment. Thus, the CMC enhancement of encompassing interpersonal knowledge was assessed to be medium.

Interactive Broadcasting

Both FTF and CMC meetings were used to interactively broadcast messages to many members simultaneously for the purpose of maintaining ties and values. In the FTF meetings this was accomplished through "circle time" where community announcements were made. The interactive broadcasting aspect of community was highly enhanced by CMC. All three types of social support were evident in the virtual interactions. First, in terms of community building/protection, use of CMC e-mails with group distribution lists were highly effective at informing community members of schedule changes or announcements. For example:

> Hey guys! Wed. is our Aug. pot-luck and pictures. The theme for the pictures is under the water, beach, etc. Anything along those lines!! See ya'll then!! Also NO class Labor Day Mon.!!

Community members appreciate this type of virtual interaction and feel they are valuable to the community. For example, in an interview, one individual stated:

> [The e-mails] are very important. … especially the informational e-mails when there's a time change or schedule change or to remind us of potluck lunch week or, you know, when the pool's closed. I don't how [Person A] keeps up with it. I just seem real scatter-brained as far as dates and times.

It is interesting that in both the FTF and virtual environments one individual [Person A] became an informal "leader" who coordinated announcements. In their study of power relations, Nguyen et al. [2006] found that in virtual communities that have no anonymity, social relationships mirror off-line relationships. This certainly was the case in this HVC.

While this interactive broadcasting feature was often used for community building messages, e-mails giving and receiving emotional support (personal, inspirational, and humorous) as well as instrumental support were also e-mailed to the entire community. The interviews revealed that the subcategories of forwarded inspirational or humorous exchanges, although not initially created by community members, were often valued as "encouraging,"

"uplifting," or "entertaining." At times, though, some members felt they received "too many forwarded e-mails" and viewed them as "just busybody reading."

Both health-related and general instrumental support exchanges also were broadcast to the entire group. For example, one e-mail stated:

> I had a neighbor who had bought a new pickup. I got up very early one Sunday morning and saw that someone had spray painted red all around the sides of this beige truck (for some unknown reason). I went over, woke him up, and told him the bad news. He was very upset and was trying to figure out what to do probably nothing until Monday morning, since nothing was open. Another neighbor came out and told him to get his WD-40 and clean it off. It removed the unwanted paint beautifully and did not harm his paint job that was on the truck. I'm impressed! WD-40 who knew?

The broadcast e-mails were mentioned multiple times in the interviews as being "very important." Therefore this CMC feature was rated as highly enhancing the community's functioning.

Memory

Short-term memory problems are some of the numerous symptoms of MS. Several members said that they felt "scattered" at times. People tended to be good natured about it, while recognizing limitations. When asked about the importance of e-mail correspondence on a 1 to 5 scale, with 1 being low and 5 being high, the average response was 4.5. E-mail communication was seen as a good way of remembering community information. For example, one member stated, "… it is important to keep each other informed about changes in schedules, or somebody's in hospital, or… You know, just things involving the class." One advantage of having CMC is the ability to search through past e-mails and find data. This capability was important for all three types of social support. For example, in terms of community building/protection, if an e-mail had been sent about the pool being closed in August for repairs, but, the individual had forgotten the exact dates, the CMC search mechanism could be used to find that particular information. The search capabilities also allowed members to search their e-mail for previous notes of encouragement, jokes, inspirational items, or factual information. Therefore, the degree of community enhancement provided by CMC was rated high.

Break out and Reassemble

In FTF sessions there were ample opportunities for the community to break into smaller groups and carry on informal discussions. In fact, most of the hour long exercise session was spent in the small group discussions. These discussions incorporated both emotional and instrumental support. A lot of care and encouragement was expressed through these smaller discussions. For example, "You look great! You are so tan. You must have been out in the sun lately." Emotional support through humor was also expressed by the members joking with one another. The interviews revealed that this type of emotional support fostered social capital in terms of feeling cared for and the sense of belonging [Wellman and Frank, 2001]. This time was valuable in allowing members to bond and emotionally support each other.

CMC also allows smaller conversations to occur between a subset of group members. For example, one interviewee stated:

> It's easier, I'll say, than picking up the phone. It's something that's automatic and I don't have to think about or make time for. I just sit down at the computer and, bam, e-mail is there.

Instrumental support in terms of exchange of factual information was done in the breakout groups in the FTF environment, but only occasionally through e-mail. In the FTF sessions, questions about medications or treatments were often asked and answered. For example, "What do you know about the clinical trials at [XXXX] that will be starting next month?" Information was sometimes exchanged in e-mails of subgroups, then presented to the larger group. For example, two members exchanged e-mails regarding the contents of a survey for the United Way. Once the survey was finalized, the entire group was informed. Many of the e-mails sent, however, were to the entire group. Therefore, the degree of community enhancement provided by CMC was rated as medium.

Cooling-off Mechanisms and Civility

In this particular HVC, during the six-month study, there were no heated arguments or disagreements in either the FTF meetings or in the CMC dialogues. This may be the result of the type of group, community size, or simply the personalities involved in the group. In terms of Drentea and Moren-Cross's [2005] social support framework, activity in this area would fall under emotional support and/or the community protection category in which members might correct or chastise others that made inappropriate or insensitive remarks.

Summary of CMC Aspects of Community

Table 3 provides a summary of the aspects of community and an assessment of the degree to which CMC enhanced community interactions is provided. Three aspects of communities—access, interactive broadcasting, and community memory—appeared to be highly augmented by virtual interactions. Virtual mechanisms for providing the ability to break out into smaller groups, exchange information, and potentially reassemble also contributed to community enhancement and maintenance, but in a lesser way. Encompassing Interpersonal Knowledge in this HVC environment where e-mails were used to communicate virtually, was effective for giving and receiving emotional support. However, the ability of CMCs to enable community building through enhanced encompassing interpersonal knowledge of the members was low. In the data collected, CMC dialogues had no impact on civility and cooling of mechanisms.

V. DISCUSSION AND RECOMMENDATIONS

This article makes important contributions to both research and practice. Lin [2001, p. 29] states, "social capital is resources embedded in a social structure that are accessed and/or mobilized in purposive actions." A number of researchers have called for additional research on identifying the conditions under which virtual communities enhance or decrease social capital [Nie et al., 2002; Quan-Haase et al., 2002; Drentea and Moren-Cross, 2005]. One contribution of this work is that, unlike much other IS-health research, this study investigates a hybrid community rather than a community that is either virtual or FTF but not both. Results indicate that CMC increases social capital above and beyond that of FTF meetings. Specifically, the data support that social capital operates through community building/protection, emotional, and instrumental support in a HVC. Thus, this research helps address this gap in the health-IS literature.

Using the theoretical foundation of social capital, a second major contribution is that this article extends existing theory creating a new framework by combining Drentea & Moren-Cross's [2005] social support framework with Etzioni and Etzioni's [1999] aspects of community framework. The data collected and organized by this new framework provides detailed insights into the social support exchanges by which social capital is maintained and built within each aspect of community. Specifically, I investigated six aspects of communities. In this particular HVC, CMC capabilities positively influenced access to the community, interactive broadcasting of messages, and community memory capabilities. In these community facets, several types of social support exchanges were present. CMC strongly facilitated community building/protection in which the community was organized and norms upheld. It permitted greater access to the community despite physical absence or disabilities. It allowed quick and instantaneous distribution of the community-relevant information, such as changes to schedules, emotional support, including inspirational messages and humor, and instrumental support to all the members of the community. CMC also facilitated search and retrieval of messages. It allowed emotional support exchanges among individuals and small groups and also enabled instrumental exchanges in which subsets of the community worked on projects before they were presented to the entire group. CMC enhanced emotional support exchanges that allowed community members to gain more intimate interpersonal knowledge of others. This was effective when one of the members could not be present at the FTF meetings, or when the exchange was time-sensitive, such as passing along information about treatment options. There was no evidence to support community enhancement via cooling off mechanisms and civility. However, it may be that the personal characteristics of individuals involved in a community may have influenced this latter aspect. Thus, the data show that five of the six community aspects taken originally from Etzioni and Etzioni [1999] were present in this HVC.

It should be noted that in this study, CMC did not uniformly enhance social support to the same degree for all aspects of community (see Table 3). It is possible that other types of richer CMC exchanges, such as those enabled by social networking sites, may more strongly augment community enhancement. A major weakness of the e-mail exchanges was that they did little to improve encompassing interpersonal knowledge in terms of identification with the group and authentication of individuals. Creating a Facebook group that contains richer media, such as group pictures, could potentially lead to greater identification with the community. Individual pictures might also assist especially with new members feeling more comfortable in knowing who they are communicating with. From a theory perspective, It would be interesting to investigate whether media richness theory could be used to further expand the framework developed in this research.

Practical Implications

These findings should be especially relevant to practitioner groups involved in healthcare that sponsor FTF groups such as the US National Multiple Sclerosis Society or other health-related institutions. While the majority of exchanges in the MS hybrid community was not "health-related" in terms of specifically addressing treatments or disease itself, many of the exchanges promoted emotional support, which is critical to well-being. In this case, although the primary purpose for the group was physical strengthening and exercise for MS patients, the unintended

positive consequence was also increased social support. Organizations that consider sponsoring these types of groups should include enhanced social capital in their "cost-benefit" evaluation of whether to sponsor a program.

The results also imply that commonly available CMC tools, such as e-mail, may augment social support in these types of groups with negligible dollar expenditures and minimal administrative setup. In this case, all members had personal e-mail accounts, and, therefore, the sponsoring organization did not have any cash outlay to support the CMC exchanges. In terms of administrative setup, one member of the group volunteered to keep the member list up-to-date. This list included name, address, phone, birthday, as well as e-mail address, and was periodically distributed to members. Again, this did not cost the sponsoring organization money or personnel. However, it was a critical function. Therefore, sponsoring organizations should ensure that this someone takes this responsibility. With different types of CMCs the tool cost or administrative costs may vary. For example, if a community created a Facebook group, there would be no tool cost and the administrative functions could still be handled by a volunteer, but might require more effort in terms of setting up and administering a group. For online forums, groups might prefer to have a forum moderator who could remove inappropriate posts. Other technologies such as video conferencing, would be more expensive.

Limitations and Future Research

As with all research, this study should be interpreted with an understanding of its limitations and generalized to other situations with caution. Although efforts were made to carefully collect and transcribe observations and notes, because the researcher did not attend all FTF sessions, there may be some interactions that were omitted. However, the longitudinal nature of this case study which included observations over multiple sessions somewhat mitigates this concern.

Another limitation is that this research was based on a case study of a particular type of HVC—an aquatics group consisting of multiple sclerosis patients. Therefore, the results should not be generalized without future research and careful evaluation. One recommendation is that future research should compare and contrast the results with other types of communities that are (a) not patient-centric and (b) are patient-centric but have different types of health outcomes (e.g., terminal illnesses). While the community members in this case had the choice of whether to participate in this specific community, they did not have the choice as to whether they contracted the disease. Thus, a key commonality among participants was not under their volitional control. They were able to "opt-in" or "opt-out" of the aquatics groups, but were not able to "opt-out" of having multiple sclerosis. This is unlike other non-patient centric communities that are totally under the member's volitional control, such as a sports-related community. Multiple sclerosis can be a debilitating disease, but is typically not considered to be terminal. The frequency of types of social support exchanges may differ based upon these characteristics.

Future research should investigate the types of social support by aspect of communities for communities that differ on the "virtualness" continuum (the amount and the frequency of contact in FTF and virtual environments) [Fiol and O'Connor, 2005] as well as in community origin. Koh and Kim [2003] found that where the community originated (either off-line or online) affected different aspects of members' sense of virtual community. They suggested that further study is needed. Applying the concepts of the "degree of virtualness" and community origin, configurations of various types of communities could be compared. In this study's HVC, the community originated from an off-line aquatics class and the FTF interactions outweighed virtual ones. In other health-related HVCs, such as patient advocacy groups that seldom meet, virtual interactions would be more prevalent than FTF ones and the community may have originated in the online environment.

An open coding approach was used to identify subcategories of emotional support and instrumental support. Specifically, emotional support was further categorized as personal, humorous, and inspirational communications. Instrumental support as categorized as health or non-health related, with exchanges from the later being general news, interesting historical facts, merchandise, and computer-related issues. Future research should also investigate whether these subcategories exist in other types of HVCs and whether other types of subcategories exist. By understanding this, we could gain a richer understanding of how emotional support is developed and maintained.

Future research can also investigate the health-related instrumental support given in these types of communities from a consumer health informatics perspective. Because a goal of consumer health informatics is to link laymen with the right health information at the right time [Koch and Hägglund, 2009], one question to be asked is whether participation in a health-related HVC expands the quality and breadth of information that members are exposed to relative to individuals who don't participate in such groups. Members who may not proactively seek information on their own may be spurred by others in the community to do so. It would also be interesting to examine whether the quality of shared information tends to be higher in HVCs than for purely virtual communities because members may feel more accountable to others as a result of FTF interactions.

VII. CONCLUSION

This research is important because it fills a void resulting from the paucity of health-IS investigations of hybrid communities. It also provides a new framework, grounded on past theoretical work and supported by this empirical investigation, upon which future research can build. These results suggest that much additional research on health-related HVCs should be conducted, including comparing the enabling aspects of communities that differ (e.g., the degree of FTF contact, the origin of the community, the community's central purpose, etc.). The hope is that this research acts as a catalyst for future HVC research, as well as for organizations that may sponsor these types of communities.

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